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Some Recent Advances in Veterinary Therapeutics and Diagnosis of Special Interest to the Practitioner*

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This paper has been written with the object of conveying to veterinarians and particularly to the practitioners some recent advances of practical interest in therapeutics and diagnosis which have appeared in veterinary literature within the past few years. As you are aware, I am not a practitioner, but I delve considerably into veterinary literature generally, so that I feel I may be able to convey some useful points of practical interest from the literature to the practitioner and others who may not have the time or the opportunity to follow recently reported observations for themselves. My rôle to-day, therefore, will be largely that commonly attributed to the "fair sex" of "spreading the news."

Owing to limitations of time and space many important recent advances in veterinary medicine are entirely omitted, but it is believed that the majority of veterinarians will have become acquainted with most of these already, so that an attempt has been made to devote the time and space available to material of less common knowledge, keeping in mind those members of the profession who have not graduated within recent years. Some of the conditions described in the paper have not yet been recorded as existing in Ireland, although it is believed that they probably exist undetected, either because they are being mistaken for other diseases or because the animals which they affect are of comparatively small value and therefore do not usually receive professional attention. One of the aims of this paper is to bring these conditions to the notice of the practitioners with the object of stimulating a discussion thereon so that such conditions may be afterwards looked for and recognised should they exist in this country. It is hoped, therefore, that practitioners and others will give us the benefit of their experiences.

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STAPHYLOCOCCAL AND STREPTOCOCCAL INFECTIONS

TOXOIDS AND ANTITOXIC SERA

It must be admitted that the ordinary vaccines, autogenous or otherwise, which are made by culturing and heating the causal organisms have given disappointing results in the treatment of both staphylococcal and streptococcal infections, but recently the whole outlook of preventive and curative treatment of these infections would appear to have been altered by the realisation of the importance of a discovery made many years ago that many pathogenic staphylococci resemble diphtheria and tetanus bacteria in producing soluble toxins. It is thus being now realised that staphylococcus immunity is antitoxic rather than antibacterial in nature, the immunity being derived chiefly by the production of antitoxin. This has enabled recent workers to prepare antitoxic sera and toxoids for the treatment of conditions due to these organisms.

Antitoxic sera are prepared from the horse by repeated injections of the toxin of these organisms in the same way as antitetanic serum and antidiphtheritic serum are prepared and these have proved of value in the treatment of such acute infections in the human (caused by staphylococci) as osteomyelitis, septicaemia and other toxaemic conditions. Staphylococcus toxoids are simply modified toxins prepared in the same manner as tetanus toxoids by adding a low concentration of formalin to the toxic filtrate of the organism. They are used in subacute and chronic infections due to staphylococci and these are, of course, far more common than the acute cases and are much more important from the veterinary point of view. Whitby, Murray and Dolman have recently recorded excellent results from the use of toxoids in chronic or subacute staphylococcal conditions in man such as chronic osteomyelitis, acne, furunculosis, blepharitis, etc. A course of six to eight injections is given at intervals of five to seven days. The progress of treatment can

be controlled, if desired, by measuring periodically the level of antitoxin in the blood. This work is so recent that an opportunity for an extended trial on animal infections, due to staphylococci, has not yet presented itself, but it holds out very encouraging possibilities for the treatment of such conditions in animals as quittor, fistulous withers, poll-evil, follicular mange, and interdigital abscesses in dogs, some forms of mastitis, botriomycosis, suppurative inflammations of cavities or mucous membranes, gangrene, acne, etc. It is well to remember, however, that not all strains of staphylococci are capable of producing toxins and that the success of this treatment must depend upon the toxigenic capabilities of the causal organisms. Regarding streptococcic conditions, the *Streptococcus pyogenes* in human infections would appear to be in a similar category as regards toxoid treatment to the toxin-producing staphylococci inasmuch as the *Streptococcus pyogenes* is capable of producing toxin from which toxoids have been evolved, and these have proved of value in human infections; the streptococci from animal diseases, however, appear to produce no toxin, so that the toxoid method cannot therefore be applied to such animal diseases.

Prontosil

This agent belongs to the azo-dye series and was recently introduced into human medicine by Hörlein in the treatment of streptococcic infections. It appears to be almost non-toxic for the host. Many new chemotherapeutic remedies have appeared from time to time, but it is only in the treatment of protozoal diseases and spirochaetes that the use of specific drugs has been attended with any marked success, since in diseases due to the lower differentiated bacteria, such as streptococci and staphylococci, little has been achieved, and even now only the most optimistic expect much success from chemotherapy in the latter field. It seems as if there exists some radical difference between the more highly differentiated organisms as protozoa and spirochaetes and the lower forms as streptococci and staphylococci which has prevented successful treatment of the latter by chemical means. As an example, the treatment of piroplasmosis by acaprin is obviously on the same basis as the well-recognised treatment of syphilis and trypanosomiasis and other protozoal diseases by arsenical, antimonial and other synthetic compounds, whereas the position regarding prontosil in the treatment of streptococcal infections would appear to be on a different foundation. In veterinary therapeutics, perhaps the only clear example we have of a drug exerting a specific action on bacteria is iodine in the treatment of actinobacillosis of bovines. It is impossible to believe that, in the doses given, iodine administered by the mouth has any direct bactericidal action on the organisms at the site of the lesions; the action, whatever it may be, is almost certainly an indirect one. In the case of prontosil, however, it has been shown by Colebrook, Buttle and O'Meara that although this agent has no bactericidal action against haemolytic streptococci *in vitro*, yet when man or animals have been treated with it, their blood can destroy haemolytic streptococci when applied in *in vitro* tests. From these experiments it seems probable, therefore, that the bactericidal action which develops in the blood of prontosil-treated animals is due to the presence of sulphonamide which is produced from prontosil by the reduction of that substance in the body. It is believed that this is the first occasion on which any germicide has proved capable of killing bacteria in the blood in a concentration obtainable in the blood of the animal, without the animal itself suffering any poisonous effects, so that the significance of this work can hardly be overestimated.

Although a very definite advance has undoubtedly been made in chemotherapy by the introduction of prontosil, much remains to be done in discovering the capacity and limitations of this remedy. Recently Colebrook and Kenny have claimed very striking results by the oral and intramuscular administration of prontosil in the treatment, in the human, of puerperal fever, which is an acute condition caused by the *Streptococcus pyogenes*. The streptococci of animal diseases, however, are different from those of the human, belonging to different species or groups. The importance of this lies in the fact that prontosil has so far been shown to be active only against the *Streptococcus pyogenes*, while its action against certain other streptococci is still uncertain. Its full range of action is still unknown, so that we have therefore no proof at the moment that this agent will prove equally successful in the treatment of streptococcal infections in animals except in those rare cases of bovine mastitis which are due to the *Streptococcus pyogenes* implanted in the udder from human sources. However, in view of our recently acquired knowledge, this agent holds out considerable possibilities in the treatment of strangles and many other streptococcal conditions in animals.

Entozon

Many well-known practitioners have recorded very successful results with entozon in the treatment of metritis and mastitis due to streptococcal infections. In metritis in the cow and mare the uterus is irrigated with a solution of 1 in 500 to 1 in 1,200 as in the well-known iodine treatment. The same strength or a slightly weaker solution is used in the treatment of mastitis in the cow by infusion into the teat

canal as described under mastitis. It is also recommended for the treatment of wounds. This agent is an acridine derivative.

Non-Specific Protein Therapy

Some authorities claim good results in the treatment of certain specific diseases by the injection of foreign proteins and they maintain that the beneficial results of a vaccine or antiserum are not entirely specific, but are due to some extent to the antigenic action of the foreign proteins present. The snake-venom treatment for the prevention of poisoning by snake bite, the grass-pollen treatment for the prevention of hay fever and the bee-venom or bee-sting treatment for rheumatism in the human are based on protein therapy.

Woodrow records very encouraging results in the treatment of secondary infection of follicular mange in dogs by the injection of a preparation called antibacsyn, which contains chiefly ox serum euglobin. Three injections, each of 2 c.c., are given at intervals of three days. This treatment is used in conjunction with the ordinary mange dressings for the destruction of the parasites on the skin.

Several clinicians have recently claimed highly successful results in the treatment of some acute febrile conditions by the use of a Bayer product called omnadin. This agent is a protein preparation made by adding a solution of animal fats and lipoids to simplified protein substances obtained by fermenting non-pathogenic bacteria. It is claimed that this preparation initiates immunity by non-specific means and reinforces the specific antigenic action in the body. It is thus recommended for the treatment of acute febrile conditions due to unknown organisms which are not susceptible to specific treatment, such as pneumonia, strangles, equine influenza, the complications of distemper, etc. It is best administered intramuscularly.

An observation of some practical interest may be noted here. Good results have been recorded in France and in this country in the treatment of septic open joint in the horse by the injection into the joint of a quantity of milk-whey, prepared from milk by the addition of rennet, all aseptic precautions being observed in obtaining the milk and in making the injections. Professor O'Connor has had a number of very successful results with this treatment. There obviously remains a wide field for further research not only in the practical value of protein therapy but also in the process underlying it.

HYPOCALCAEMIA OR BLOOD-CALCIUM DEFICIENCY DISEASES

Within the past few years a number of conditions in animals have been shown to be due to a drop in the calcium concentration of blood (hypocalcaemia) and calcium therapy has proved to be of specific curative efficiency in their treatment. The chief of these are milk fever, some forms of "staggers" in cattle, impaction in milking cows, lambing sickness in ewes and goats, parturient eclampsia in sows and bitches and transit tetany in mares. Lactation tetany in cows is usually also associated with a slight hypocalcaemia.

Milk Fever or Parturient Paralysis

Most clinicians will no doubt be aware that the udder inflation treatment for milk fever is rapidly giving way to the more scientific method of calcium therapy, based on the recent work of Dryerre, Greig, Little, Wright and others, which has elucidated the aetiology by proving that the milk fever syndrome is immediately dependent upon acute hypocalcaemia or at least that this condition is intimately associated with a calcium deficiency of the blood. It has been suggested by several authorities that the blood calcium deficiency is not the immediate cause of the attack, but that it permits the absorption of as yet undetermined toxic metabolites which are the actual exciting factors, but such opinions must, at least for the present, be merely speculative. It should be clearly recognised that in milk fever the cow possesses within her body an abundance of calcium which is contained in the bones and that the pathogenesis of the disease would appear to consist in an inability on the part of the system to mobilise the calcium quickly enough from the skeleton to the blood, so that the calcium is not being restored to the blood as rapidly as it is being transferred from the blood to the milk during the very active period of milk formation. This inability to mobilise the calcium from the skeleton to the blood is probably due to a relatively quiescent state of the parathyroids after parturition. The blood magnesium in milk fever is normal or may even be slightly elevated.

The reduced blood calcium can be restored by the subcutaneous injection of calcium borogluconate and this has proved an effective remedy in the treatment of the condition. The following formula is that generally in use: Calcium gluconate 2 oz., boric acid 3 drachms, water 12 oz. The mixture is boiled and after cooling is injected subcutaneously, at three or four points. In the case of highly susceptible cows this treatment may be adopted as a preventive on one or more occasions within the first few days after calving.

Lambing Sickness in Ewes

This condition is best known in Scotland and it simulates milk fever, affecting ewes, usually during lactation. It is not, however, so closely related to parturition as milk fever in the cow

since it may occur several days before or several weeks after parturition. It readily responds to mammary inflation or calcium therapy as in the case of milk fever.

Hypocalcaemia in Pigs and Dogs

Conditions resembling milk fever, commonly called parturient eclampsia, are met with in sows and bitches, usually during lactation. They appear to be fairly common in the sow. These conditions readily respond to calcium therapy, indicating that they are associated with diminished calcium content in the blood.

Carlström describes a condition in young pigs, particularly those which are rapidly growing. The symptoms are associated with feeding and are seen either as muscle stiffness or latent tetany, or as convulsions (manifest tetany). The blood calcium is markedly reduced, being only about 6 mg. per cent. instead of the normal 10 mg. These cases respond readily to calcium therapy. When these cases occur chalk and milk should be added to the ration.

"Staggers" in Cattle

A number of conditions are at present described under the generic name "staggers" as affecting cattle of both sexes. Their general symptoms are well known. A proportion of these cases yield rapidly to calcium therapy, so that it would appear that these are associated with reduced blood calcium concentration. Others, however, do not respond to this treatment, thus indicating that they are due to a different cause. Some of the conditions diagnosed as "staggers" may be cases of ragwort poisoning (liver cirrhosis) or even of lead poisoning. Nevertheless, in cases of so-called "staggers" where the cause cannot be ascertained, calcium treatment is always well worth a trial since, if not effective, it cannot have any adverse influence.

Impaction and Constipation in Milking Cows

Greig describes a condition as being frequently met with in milking cows which is characterised clinically by acute impaction of the rumen, and by constipation. The animals affected are cows which possess deep milking qualities and which have been intensively fed for high milk production. In these cases the blood calcium concentration is below normal and it is known that a lowered blood calcium is associated with paresis of the alimentary tract; consequently, the injection of calcium in such cases is followed by the resumption of peristalsis.

Grass Tetany or Lactation Tetany or Grass Staggers

This is a condition which may be readily mistaken for milk fever, which it closely resembles in its clinical manifestations. It occurs most commonly in lactating cows after they have been turned out to grass in the spring, hence the term "grass tetany." However, it may occasionally be met with at other seasons of the year, even in stall-fed animals, and sometimes barren cows or heifers or bulls or even calves may be affected. It is very prevalent in certain parts of England and is confined to certain districts, while in other districts not far distant its existence is unknown. This localisation would suggest some peculiarity of the soil or pasture as a probable causal factor. It is associated with a marked fall in the blood magnesium; in fact, it has been shown by Blakemore and Stewart that in these tetany districts the blood magnesium of all the cows falls after they have been put out to grass in the early spring, but after two to three months it returns to normal, while in other normal districts no such fall occurs. The great majority of the clinical cases occur during the season of the year when the magnesium content of the blood is low, although not by any means all the cows with low magnesium content develop symptoms; in fact, many animals with very low magnesium blood content escape the clinical manifestations of the disease. There is usually also a slight fall in the blood calcium. This disease has not, so far as I am aware, been recorded in Ireland, but I understand from observant practitioners that it occurs and that it is being frequently confused with milk fever, to which it bears a close resemblance, and this may possibly explain those cases of so-called milk fever which fail to respond to the recognised milk fever treatment; indeed, according to Green, Allcroft and Montgomerie, a mixed metabolic disorder occurs in bovines in which both calcium and magnesium deficiency in the blood are pronounced and in which the symptoms are so ambiguous as to render clinical differentiation almost impossible as between grass tetany and milk fever. These cases may be described as "atypical lactation tetany" occupying a category midway between grass tetany and milk fever.

The typical symptoms of ordinary cases of grass tetany are hyperaesthesia, twitching of the muscles, and in acute cases frequent tetanic convulsions. If the animal be startled the eyes blink, the membrana nictitans becomes protruded and the animal may pass into a convulsive seizure. This condition is not closely associated with calving time.

Milk fever, on the other hand, usually occurs shortly after calving; there is trembling but no twitching of the muscles, and no hyperaesthesia. The animal is dull and after a period of excitement accompanied by paddling of the hind limbs, etc., passes into coma.

After what has been said regarding blood magnesium deficiency it may seem disappointing to state that magnesium therapy does not

appear to be an effective remedy in the treatment of this condition. Magnesium lactate combined with calcium gluconate has been tried but with disappointing results. It may thus be that the magnesium deficiency is not a causal factor in the condition, but may occur simply under the same conditions or factors as those which produce the symptoms of the disease.

A few weeks ago a very interesting article by Blakemore, Nicholson and Stewart was published at Cambridge. These workers have shown that the magnesium content of the blood may be reduced, without the manifestation of lactation tetany symptoms, by the daily administration of manganese chloride and, further, that the blood magnesium will return to normal after a time, despite the continued administration of manganese. They have also shown that the manganese content of the pasture in lactation tetany districts is abnormally high, thus suggesting that the consumption of this manganese-rich pasture is responsible for the temporary drop in blood magnesium which occurs in cows in these districts; it is not suggested, however, that the manganese itself is responsible for the disease. It is also pointed out that there is no lack of available magnesium in lactation-tetany pasture and that magnesium therapy has not proved to be of any curative value.

However, it can be said that up to the present no case of the disease has been recorded in which a low blood magnesium level was not present, although a number of cows in the same herd may show this and yet only some of them will suffer from an attack. Here the position must rest for the present.

Since there is usually a slight drop in the blood calcium the ordinary milk fever treatment is the only course which can be adopted; but many practitioners prefer to combine magnesium with the calcium.

Equine Transit Tetany

This is a condition first described by Montgomerie, Savage and Dodds as affecting Welsh ponies of both sexes, but usually suckling mares which had just completed a railway journey under cramped conditions. It may occur as early as 21 hours after the commencement of the journey, or occasionally it may be found in suckling mares as the result of ordinary transference from pasture to confinement in the stall. Its occurrence has been recognised in Wales for over 20 years but, so far as I am aware, it has not yet been recognised in Ireland.

It is distinguished from tetanus by the suddenness of the onset, the history and the absence of protrusion of the membrana nictitans. It appears to simulate atypical lactation tetany in cattle, thus occupying a category somewhat midway between milk fever on the one hand and lactation tetany on the other, since there is a marked fall in both the calcium and magnesium content of the blood (Green, Allcroft and Montgomerie). A similar condition called "railroad fever" affecting cattle has been described by Detrez in France. An interesting contrast between transit tetany in horses and lactation tetany in cattle is that the former affects horses, usually suckling mares which have been recently transferred from freedom at grass to confinement as in the railway waggon, whereas the latter affects cattle, usually lactating cows which have been recently transferred from confinement in the house to freedom at grass. It is therefore suggested that there is a group of clinically separable disorders associated with disturbance of magnesium and calcium levels in the blood for which a common physiological explanation ultimately will be found. Transit tetany was at first believed to be associated only with blood calcium deficiency, the magnesium deficiency being discovered at a later date after lactation tetany in cattle had been investigated. Regarding treatment, satisfactory results have been obtained with calcium therapy as for milk fever.

BIOLOGICAL PRODUCTS

Much research work has recently been carried out on the biochemical lines of treatment, since substances produced by the body itself are regarded by many as the most likely source of efficacious remedies, and auto-pharmacology has now become a well-recognised branch of science. Such substances may be produced by a gland and have a general action or they may be produced in different situations or tissues and have a more or less local action. Many of these substances have been prepared and put on the market, and the discovery of two of them has been generally recognised as the two outstanding achievements in medical science within recent years, namely, insulin for the treatment of diabetes, and liver extract for the treatment of pernicious anaemia in the human. Other biochemical preparations are adrenalin, pituitrin, thyroid extract and several others not so well known, such as acetylcholine, prolan, and other sexual hormones. Most of these are well established in veterinary practice, but prolan, acetylcholine and insulin have only recently been introduced into this field. Prolan and other sexual hormones are described under "Sterility."

Insulin in the Treatment of Myoglobinuria ("Azoturia") in the Horse

The successful use of insulin in the treatment of equine myoglobinuria (azoturia) was recorded in Germany about three years ago, and since that time several clinicians have used this agent with striking success in this disease. The treatment is based on the biochemical findings

that the blood contains an excess of sugar (hyperglycaemia) together with an increase in the phosphate and creatinin and only a very slight increase in the lactic acid, presumably due to the animal having received a diet rich in sugar during its period of rest prior to the onset of the symptoms.

Wright, in London, has recorded recently the successful treatment of two cases. These animals were down before treatment commenced and, judging from past experience of this disease, would probably have died despite the earlier forms of treatment. In one case treatment commenced seven hours after the onset of the symptoms and the animal received 100 units of insulin daily for ten days before it was sufficiently recovered to justify treatment being discontinued; complete recovery ensued. In the other less severe case treatment commenced five hours after the onset of the symptoms and the animal received 150 units of insulin daily for seven days before recovery became advanced. The injections were made intramuscularly into the neck and behind the shoulders. The cost of insulin is approximately 1s. per 100 units, so that the treatment of a case would evidently cost about 10s.

Acetylcholine

Acetylcholine is normally present in the bowel as the result of decomposition of bile in the large intestine into glycero-phosphoric acid and choline, the latter being converted into acetylcholine; but this substance is also produced in the tissues themselves. It is essential for intestinal peristalsis and some authorities believe that paralysis of the intestine is due to an insufficient supply of this substance. It has therefore been used recently in the treatment of colic in the horse due to impaction resulting from reduced peristaltic action. Harvey has recorded good results from its use. He recommends small doses of 7½ grains given subcutaneously or intramuscularly at short intervals until peristalsis reappears, or a single large dose of 15 to 18 grains may be given. Occasionally toxic symptoms may appear in the form of muscular tremors, but these soon pass off. Harvey suggests that its action might be increased by the addition of a small dose of eserine.

Diagnosis of Pregnancy

About six years ago a biological test for the diagnosis of pregnancy in the mare was introduced. It was popularised in Great Britain and Ireland by the excellent work of Miller. Two methods were at first adopted, one based on the presence of a gonad-stimulating hormone (prolan) in the blood serum and the other based on the presence of a hormone called oestrone in the urine of pregnant mares. The latter method has proved the more practicable and is now adopted almost solely. The urine to be examined is tested on oöphorectomised (female) mice in which, after injection, it brings about cornification of the epithelium of the vagina similar to that found during the normal oestral periods in these animals. Miller recommends that the urine for examination be collected in the morning so as to avoid the diluting effects which exercise, work, copious draughts of cold water, fear or other powerful emotions might have on kidney excretion.

Usually a diagnosis can be made about the sixtieth to the sixty-fifth day after conception, but in some cases it can be made as early as the forty-second day. Without decrying the advance which has been made in pregnancy diagnosis by this test and the great boon it has proved to be to the breeder of valuable stock it is well to emphasise that it is not 100 per cent. reliable, particularly on the positive side. On the negative side it appears to be as near perfection as it is possible for any biological test to be, since Miller records that he has not had a single case out of over 2,000 in which a mare, more than 120 days after service, has given a negative result and has ultimately proved to be pregnant. On the positive side the results are less favourable since Miller records that he has had a considerable number of mares in which perfectly good and apparently normal positive results were obtained, sometimes in two successive tests, and yet ultimately these mares did not prove to be pregnant or at least the presence of their foals was never revealed. These errors, or apparent errors, may possibly be due to two main causes. Firstly, it has been shown that non-pregnant mares with advanced cystic ovaries may excrete oestrone in sufficient quantities in the urine to cause their urine to give a positive reaction, and secondly, there are undoubtedly many cases in which early abortion occurs unrecognised subsequent to the taking of the sample of urine. Furthermore, Miller believes as a result of his observations on other animals that it is not improbable that early death and subsequent atrophy of the foetus may occur unrecognised as a result of a mineral or a vitamin E deficiency. Such mares, of course, would give a positive reaction to the test.

A clinical method for the diagnosis of pregnancy in the mare has been described by a well-known practitioner in this country (Louis Magee) and also by Dimmock and Fincher in America. From about the thirtieth day after conception the mucous membrane of the vagina usually becomes pale, dry and gummy and the walls tend to become gummed together. The cervix of the uterus becomes sealed by a plug of mucus. The vagina is best examined with the aid of a speculum. It is claimed that by the recognition of this condition of the vagina and cervix, pregnancy can be diagnosed with a fair

degree of accuracy from about the thirtieth day onwards. Dimmock records an accuracy of over 75 per cent. with this method in early pregnancies, but in his cases an examination of the uterus *per rectum* for signs of pregnancy was also carried out in making the diagnosis. Contrary to what is generally believed, there would appear to be little or no danger of causing abortion in pregnant mares by rectal or vaginal examinations.

In animals other than the mare the biological test for pregnancy has not proved to be of practical value. In the cow pregnancy may be diagnosed clinically as early as from the fifth to the seventh week after conception by the presence of the uterine seal (the plug of mucus in the cervix). This can be recognised with the aid of a vaginal speculum while the passage is illuminated with a flash-lamp bulb connected to a battery. Recently a modified endoscope has been employed with success for the examination of the vagina and the uterine seal of pregnancy in the mare and cow. The uterine seal, however, is not always visible through the vagina, especially in the cow, so that a negative finding is not definite proof that the animal is non-pregnant.

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The Administration of Drugs to Ruminants in the Treatment of Parasitic Gastro-Enteritis

A mixture containing sodium arsenite and copper sulphate has until recently been considered the most efficient agent for the treatment of parasitic gastro-enteritis in ruminants, particularly in sheep, but this has recently been superseded by a mixture of copper sulphate and nicotine sulphate. This latter mixture is made up as follows: 5 per cent. copper sulphate, 5 per cent. nicotine sulphate (40 per cent.). The dose ranges from one ounce for large sheep to ½ oz. for three-months-old lambs. Correspondingly larger doses are used for cattle.

Much work has recently been done, particularly by Australian and European workers and also by Ross, Monnig and Quin, in South Africa, with the object of finding a method of administering drugs which would ensure their direct passage to the fourth stomach and intestine and thus avoid dilution of these agents in the rumen. The line of these investigations was to discover the factors which influence the closure of the oesophageal groove so that the material swallowed may pass directly to the fourth stomach (abomasum) and intestine and thus escape the rumen.

It has been found that the reflex closure of the oesophageal groove is initiated in the pharynx and anterior part of the oesophagus and that the best agent for stimulating this reflex is an astringent salt, particularly copper sulphate in from 5 to 10 per cent. solutions. The reflex is established immediately after this agent touches the pharynx, so that the stomach tube should not be used in administering these drugs. The groove remains closed for only about 15 seconds after stimulation of the pharynx, thus the drug to be used should be administered immediately after the copper sulphate reaches the pharynx.

The procedure, therefore, in drenching ruminants for the treatment of parasitic gastro-enteritis, where it is essential that the drug should escape dilution in the rumen, should be as follows: First administer 5 to 10 c.c. of a 5 to 10 per cent. solution of copper sulphate in order to stimulate closure of the oesophageal groove and then immediately (within 15 seconds) administer the drug. It is not desirable to mix the copper sulphate with the drug mixture since the first gulp may enter the rumen before reflex closure of the groove has had time to take place and a part of the drug may thus be wasted by passing into the rumen. However, should copper sulphate itself be used as one of the agents in the mixture, as is frequently the case, a small portion of the dose should be given first and then, after a pause of a few seconds when the reflex has had time to operate, the remainder of the dose should be given as rapidly as possible. Old animals in poor condition are sluggish and numb and their nervous reflexes are not in a lively state, so that the stronger (10 per cent.) solution of copper sulphate should be used in these cases. The animals should be fed on soft food beforehand and given plenty of water, since it has been found that the reflex closure of the groove occurs more readily when the ruminal contents are soft or in a fluid state.

This procedure may be adapted in the administration of any agent in ruminants where it is desirable that the agent should escape dilution in the rumen by passing directly to the abomasum and intestine.

Latent or Suppressed Sheep Scab

It has been shown, chiefly by the recent work of Downing, that there is frequently in sheep scab a latent period during the summer months when symptoms may disappear. In some affected sheep spontaneous recovery may be complete during the summer, but in many there is a relapse in the autumn. The parasites are continuously present during the latent period in such situations as the ears, the infra-orbital fossae, the inguinal pouches, the scrotum and tail. Apparently there is no change in the life cycle of the parasites during this period, but as autumn approaches they tend to migrate to the general body surface. A sheep carrying the latent form of scab may show no symptoms at all and the introduction of such sheep, during the summer, doubtless is often responsible for the infection of clean flocks.

Anaemia of Suckling Pigs

Anaemia of suckling pigs is a name descriptive of one of the principal diseases of young pigs all over the world. It is due to an insufficiency of iron in the milk of the sow and there is some evidence that a slight copper insufficiency is also partly responsible. Many authorities including Lamont and Baskett in Ireland, McGowan and Crichton in Great Britain, and Doyle, Mathews and Whiting in America have shown that the conditions favouring its development are those which preclude the consumption by the sow and suckling pigs of soil or its equivalent, since the iron and copper in the soil are essential for health. Anaemia can be produced in young pigs by confining the sows for some days before farrowing in pens which have concrete floors and by maintaining the young pigs with the sows in these pens. There is a marked decrease in the haemoglobin content of the blood and the general symptoms of anaemia become apparent. It has been noted that certain strains or families of pigs are more prone to the disease than others.

The condition can be prevented or cured by allowing the pigs out of doors and thus giving them access to soil, pasture, or cinders or grass or by placing soil or grass sod in the pens or by adding a solution of 0·1 per cent. ferrous sulphate to the feed of the young animals. For the first four weeks, however—that is, before the young animals begin to feed—a solution of about 16 per cent. ferrous sulphate mixed with an equal quantity of treacle or syrup should be applied to the udders of the sows three times daily. Ordinary commercial ferrous sulphate or ferric oxide contains a trace of copper so that the administration of ferrous sulphate or ferric oxide to the young animals will supply the iron and copper necessary for the prevention and cure of anaemia. Many believe, however, that copper merely acts the part of a catalytic agent in enabling the liver to utilise iron. It may be noted that the iron content of the sow's milk cannot be increased by the administration of iron to the sow.

Pine (Iron Deficiency Disease) in Cattle and Sheep

Pine is a condition in young cattle and sheep which would appear to be due chiefly to an iron deficiency; and a lack of copper may also be partly responsible. It is described by Greig in Scotland and Roberts and others in England and it is known to exist in many other parts of the world. It was found to be prevalent in the Inner Hebrides and on the mainland of Scotland and in certain parts of England and it would appear to be confined to those areas where the soil is very shallow and superimposed upon blown sand or granite. It has not been recorded as existing in Ireland, but there is a possibility if not a probability that it may exist and is being mistaken for parasitic or other emaciating conditions.

The symptoms are those of progressive debility accompanied by anaemia and emaciation. The animal is dull and the coat, in the case of cattle, is rough and staring. Affected animals are stunted in their growth and have an unthrifty appearance. In general the symptoms resemble those which are associated with parasitic gastro-enteritis. If this condition be suspected the faeces should be examined in order to exclude parasitic infestation in making a diagnosis.

Greig has proved conclusively that the administration of ferric oxide is effective both in curing and in preventing this condition.

Acaprin (Aciron) in the Treatment of Redwater

In veterinary therapeutics the discovery of acaprin, a urea derivative, would seem to mark an advance on anything hitherto available for the treatment of piroplasmosis of animals. Good results have been recorded in many parts of the world by its use in piroplasmosis of cattle, horses, sheep and dogs. It is free from the disadvantages of trypanblue. It may be given subcutaneously, intramuscularly or orally. Toxic effects have been noted in a small proportion of cases within 15 to 30 minutes after injection, but these usually pass off within an hour or two. These toxic effects can be counteracted by the subcutaneous injection of a compound of adrenalin called "rephrin," or of adrenalin itself, so that this agent should always be at hand when using acaprin. Harvey and Smythe and others in Great Britain and E. V. Kelly in this country have recorded most encouraging results with this agent in the treatment of redwater in cattle. Harvey states that if the animal is treated early in the attack the urine will promptly clear and the animal will recover without being greatly upset or without much loss of weight. One injection is usually sufficient to effect a cure. Until further evidence is available, however, there is still the possibility that this agent may not be equally effective against both types of piroplasms which are responsible for redwater, the *Babesia bigeminum* and the *Babesia divergens*; in fact, according to Kikuth, quoted by Hörlein, acaprin is less effective against *Babesia divergens* than against *Babesia bigeminum*. It is generally accepted that the *Babesia divergens* is the common parasite in this country. The dose of acaprin is 1 c.c. per cwt. body weight; usually about 6 c.c. given subcutaneously or intramuscularly.

Pregnancy Toxaemia or In-Lamb Ewe Disease

This is a condition described by Greig and others affecting in-lamb ewes, generally ewes

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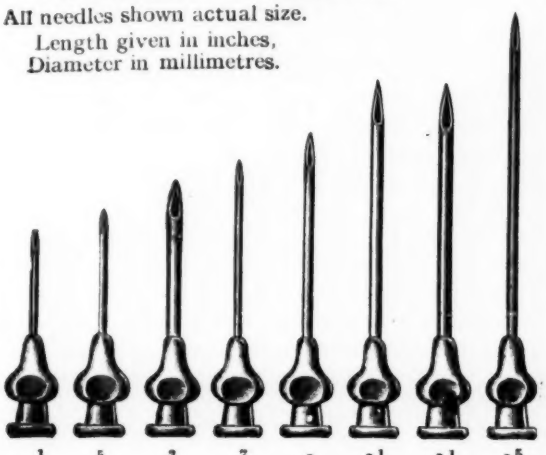

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carrying twin lambs. Observant practitioners state that it is prevalent in Ireland but that it is not usually diagnosed.

Our knowledge of its pathology is still uncertain. The first symptoms are, as a rule, observed two or three weeks before lambing time. There is almost invariably the history of high condition in the effected ewes in the previous autumn followed by a fall in condition during the winter. Its appearance frequently coincides with the commencement of hand feeding or with a snowstorm involving restricted exercise. In outbreaks the disease is frequently confined to animals of one breed and approximately of the same age. The animal does not appear to be severely ill, but is stupid and may be blind and when approached even by a dog often refuses to move. Later, usually within the first day, the animal goes down and passes into coma and death generally takes place within a day or two; but if parturition should occur before the condition becomes advanced, recovery may ensue. The most marked change noted at *post-mortem* is a fatty infiltration of the liver, but whether this is the cause or the result of the condition is not definitely known.

When outbreaks occur, the ewes should be kept on a sparse, concentrated ration for about six weeks before lambing and given about a mile or so walking exercise daily. Affected animals should be treated with glucose and given an injection of calcium boro-gluconate and attempts should be made to induce abortion.

Haemorrhagic Enteritis in Dogs

This condition is most commonly met with in greyhounds and is frequently responsible for a high mortality. The intravenous injection of a weak solution of formaldehyde has proved to be an effective remedy. The dose is 1 to 1½ oz. of a 2 per cent. solution.

Bovine Mastitis

The most important advance which has been made within recent years regarding mastitis is the discovery by Minett, Stableforth and Edwards that in outbreaks of contagious mastitis due to the *Streptococcus agalactiae* many cows in the infected herd are carriers of the infection, having it in a latent form in their udders without any clinical evidence of its presence. This latent infection may persist in an animal for a considerable time and may eventually disappear without any clinical manifestations. These cases are really the main potential source of danger in the herd because, not being suspected, no precautions are taken in connection with them to prevent their spreading the disease to other cows. The first procedure, therefore, in dealing with an outbreak should be the recognition of these latent cases by having a sample of milk from each quarter of all the animals in the herd examined bacteriologically at the laboratory; as a result of this examination the herd may be classified into three groups, namely, healthy, non-clinical cases and clinical cases. Should complete segregation of these three groups not be practicable the next best procedure is to get rid of the badly infected cows as soon as possible and to arrange the milking so that the normal animals are milked first, the non-clinical cases second, and the clinical cases last. This is on account of the fact that infection is spread by milking. The clinical cases should be gradually disposed of and the healthy portion of the herd increased by the addition of clean animals, preferably first-calf heifers. All general hygienic precautions should be observed in regard to the cow-shed and the milking. A second examination of the milk from the healthy portion of the herd should be made one month after the first, and later examinations should be made every three months. The milk of the newly calved cows should also be examined. In this way Minett has shown that this form of mastitis can be controlled, at least so far as the development of clinical cases is concerned, and a clean herd can eventually be built up by replacement of the clinical cases by clean animals. It may be noted that the *Streptococcus agalactiae* is not a source of danger to the human, so that the milk of latent cases may be consumed with impunity.

Many practitioners in Great Britain and on the Continent claim that chemotherapy is a very useful adjunct to the above method of eradication in the control of this disease. They recommend infusion of the gland through the teat canal with weak antiseptics. Steck, in Switzerland, has carried out many experiments in this connection and he concluded that trypaflavine, 0·1 in 1,000 to 0·6 in 1,000, or entozon, 1 in 500 to 1 in 1,500, are the most effective. These solutions are made up with boiled water and infused at blood heat. In this connection it is important to remember that the gland is very sensitive, particularly its upper portion, so that harm may be done by using solutions which are of too high concentration. It is well known that the lower portion of the gland (*i.e.*, the milk sinuses and the largest ducts) is less sensitive than the higher portion (*i.e.*, the alveoli and the small ducts). This has been shown to be the case by Guillebeau, Hess and Steck. Furthermore, it has been shown that in cases of streptococcic mastitis the most pronounced lesions and the lesions in which the streptococci are likely to be best protected are situated in the lower portion of the gland, that is, the larger ducts and in the vicinity of the milk sinus (Stark). Our aim in this form of treatment, therefore, should be to infuse the higher portion of the gland, where it is the most

sensitive and where the lesions are least pronounced, with the weaker solutions, while the more concentrated solutions should reach only the lower portion of the gland, which is the least sensitive and where the lesions are most pronounced. The procedure thus recommended by Steck is as follows: The gland is thoroughly milked out; about half a pint 1 in 1,500 entozon or 0·1 in 1,000 trypaflavine is infused *via* the teat canal into the affected quarter and this is then milked out again. This flushes out the gross infection from the lower portion of the gland. Then a little less than two pints of the same strength solution is infused, followed by about one pint of a stronger solution 1 in 500 entozon or 0·6 in 1,000 trypaflavine. After two or three minutes this stronger portion of the solution is milked out again, and after about three hours the milking out of the gland is completed. With this technique the upper portion of the gland is treated with the weaker solution, whereas the lower portion of the gland (which is the least sensitive portion with the more gross infection) is for a short time under the influence of the stronger solution. The solution should not be injected with pressure but should be infused by gravity, using massage to force it to the higher portion of the gland. This treatment may be repeated if necessary on two or three occasions at intervals of four to six days. Steck claims most encouraging results with this method and states that of the quarters treated he has had 78 per cent. success with the first treatment, the infection in these cases having disappeared from the quarter after the first infusion. The milk yield decreases after treatment, but it generally returns to normal after about ten days.

In cases of mastitis due to staphylococci the recently introduced toxoid and serum therapy holds out some hope of success.

Sterility

Since sterility in the cow and mare is a very serious source of loss to the stock owner and much research is being carried out on this problem by leading investigators in almost all parts of the world, it may appear disappointing to record that no specifics have yet been discovered for the treatment of this condition. However, considerable success may be achieved in many cases by appropriate treatment if the correct cause be ascertained. The first step, therefore, should be to enquire into the breeding history, the services, the diet and management of the animal, and the condition and age should be noted. This enquiry should be followed by complete manual examination of the genital organs *per rectum* and an inspection of the vagina, vulva and cervix uteri. Should a persistent corpus luteum be present it should, if possible, be enucleated, and should the ovary prove to be cystic the cyst or cysts should, if possible, be ruptured *per rectum*. In those cases where no definite change can be detected in any part of the genital system it is natural to conclude that some functional disturbance is at work consequent upon upset in the production of the sexual hormones which normally govern the whole course of the sexual cycle.

The anterior lobe of the pituitary gland normally produces a hormone, called prolan, which regulates the oestral process in the ovary. This process consists of the formation and ripening of the ovarian follicle and ovum, and the secretion of oestrin and, later on, the extrusion of the ovum and the formation of the corpus luteum. In the male it controls spermatogenesis and the elaboration of testicular hormone. When the ovarian follicle is becoming mature, oestrin (or oestrone) is produced in the ovary which gives rise to manifestations of heat consisting of enlargement of the uterus and growth and proliferation of the uterine glands; it acts upon the sexual centre in the brain, thus influencing the behaviour of the animal, and this sexual centre in turn stimulates the pituitary to increased secretion. During pregnancy oestrone is also formed in the placenta in large quantities, the excess being excreted in the urine, and it is upon its presence in the urine of the mare that the usual biological test for pregnancy in this animal is based. The corpus luteum produces a hormone called progestin or progesterone which stimulates the secretion of the uterine glands and brings about the so-called pre-gravid state of development of the uterine mucous membrane which prepares for the embedding of the ovum. It also inhibits the ripening of further follicles before the normal time. Its presence therefore ensures the continuance of pregnancy, while its removal will cause abortion. In the case of the non-pregnant animal a corpus luteum which persists beyond the normal period will prevent the onset of oestrus, hence the necessity for its removal in such cases.

Some of the other endocrine glands, like the thyroid, have, no doubt, an indirect action in controlling the production of ovarian and pituitary secretions. The normal production of these sexual hormones and the consequent fertility may be adversely affected by a number of factors. These include: Over-fat condition; confinement; delayed breeding, as when young animals are not permitted to breed for a long time; high milk yield; adverse climatic conditions; serious febrile or constitutional disease; diet which is inadequate in both quality and quantity, such as deficiency in mineral salts, especially phosphates, and also deficiency of vitamins, particularly vitamin E. If any of these adverse factors should be suspected it should be corrected. There is little doubt that

faulty nutrition and environment are accountable either directly or indirectly for a much greater proportion of cases of barrenness in dairy cows and possibly in mares than is generally recognised. This is well illustrated by comparing the differences in the wastage rate from sterility in dairy herds of Denmark and New Zealand. In Denmark, where the cows were kept indoors most of the year and fed on concentrated foodstuffs for high milk production throughout the year, the annual wastage from permanent sterility amounted to about one in every 15 cows. In New Zealand, on the other hand, where the cows were kept permanently out of doors, were pasture fed and breeding was arranged to take place so that the cows calved always at the season of rich growth of grass, the proportion of barren cows in any given year was very low. Williams has shown that continued nutritional deficiencies of dairy cows lead to hypoplasia or poor development of the genital organs in the young animals so that faulty nutrition, particularly if continued for two or three generations, will result in permanent sterility.

From what has been stated regarding the function of prolan (anterior pituitary extract) it will be understood why this agent has been recommended for the treatment of sterility in the mare and cow where there is any disturbance of the oestral cycle such as silent heat or feeble oestrus. Excellent results have been claimed in the treatment of such cases by this agent. The dose is 125 to 250 rat units injected subcutaneously and it should be repeated, only after a period corresponding to the entire oestral cycle has elapsed. Prolan has been recommended also for the treatment of impotency in male animals. Some authorities claim very good results in the treatment of some barren mares by the administration of thyroid tablets, 7 to 10 grains being given daily for a period in order to promote oestrus. I am aware of one busy practitioner in this country who claims excellent results in thoroughbred mares with thyroid treatment.

In cases where there is a suspected vitamin E deficiency due to lack of green food, very encouraging results have been claimed by many authorities in Great Britain and elsewhere by the administration of wheat germ oil. This is injected subcutaneously or intramuscularly. The usual dose is 20 to 40 c.c. given on three occasions before and three after service at intervals of seven days.

Most authorities agree that the most common cause of sterility in the mare and cow is endometritis caused by infection which frequently follows parturition. In such cases the uterus should be irrigated at intervals of a few days with weak antiseptics. Nielsen's iodine treatment, using 1 in 500 to 1 in 1,000 solution of iodine, has up to the present been the most popular for this purpose, but recently many authorities have claimed better results from the use of entozon in streptococcal infections, 1 in 500 to 1 in 1,000 solutions being used in the same manner as in Nielsen's treatment. Some clinicians have used euflavine with considerable success in treating metritis.

Outbreaks of early abortion in cows associated with sterility due to a protozoan called a Trichomonas have been recorded in many countries, but it was not until recently that Stableforth recorded outbreaks in England as being due to this organism and he suggests that this organism may be a much more frequent cause of sterility and abortion than is generally believed. The chief symptoms are a clear, mucilaginous discharge from the vagina, early abortion, sterility and a tense condition of the uterus on rectal examination. The bull remains a permanent carrier of the infection. The most successful form of treatment in connection with these outbreaks was irrigation of the uterus and vagina of the cow and the sheath of the bull with 3 to 5 per cent. lactic acid as carried out by Gould.

. . . . . .

Discussion

Mr. F. W. Hart (Enniskillen): When the Council of the North of Ireland V.M.A. asked me to open this discussion I felt I should be unable to do justice to a paper written by Professor Browne, and his excellent paper is of such magnitude and importance that I propose to confine my remarks to those cases with which I am familiar.

Milk fever in the bovine as it is known to the veterinary profession of to-day is a condition generally associated with parturition and Professor Browne has given us many reasons why the calcium content of the blood is likely to fall below normal at that particular time. I propose to go a step further and refer to cases occurring at irregular periods extending from one, two, or three and up to nine months after calving, some concurrently or immediately following oestrum and those preceded by an apparent functional stomach derangement where the cow, after about three days' illness, assumes the recumbent position. These cases have responded to mammary inflation and were typical (excepting the incident of parturition) and no doubt if the blood had been examined would have shown the calcium content below normal.

What deductions may we draw from these facts, assuming that it is the parathyroid glands which control the mobilisation of calcium? Where is the regulating centre situated in the animal body when its function can be upset within a brief period under very different circumstances and permit the typical symptoms of milk fever to develop?

I use calcium therapy for those cases of milk fever where the onset is slow and the patient is staggering, but if she is recumbent I generally combine udder inflation with calcium subcutaneously. The benefits resulting from this treatment are greatly enhanced by the oral administration of a liberal amount of sugar and recoveries are exceedingly good. My predecessor 25 years ago gave me very definite instructions that cows suffering from milk fever should be given a liberal supply of sugar.

Lambing Sickness in Ewes.—This condition does occur in this country and in my opinion is influenced by the same conditions as milk fever in the case of the cow.

Staggers in Cattle.—This disorder is observed in this country generally in the months of June, July, August and September. Some of the cases may be associated with reduced blood calcium, but the majority are due, in my opinion, to various forms of vegetable poisoning of unknown origin. The symptoms are well-marked functional derangement of the digestive tract with a marked tendency to cerebral congestion.

Ragwort poisoning is not by any means common, and lead poisoning may occur at any time. The history will generally help one to make a correct diagnosis.

Impaction and Constipation in Milking Cows.—I think this condition would be better described as a functional derangement of the alimentary tract which responds to treatment with nerve tonics and a liberal supply of sugar.

Grass Tetany: Lactation Tetany and Grass Staggers.—The essayist's assertion that this ailment has not been observed in Ireland is incorrect because I have met with several cases. It generally occurs after the animals have been put out to grass and the symptoms are different from that of milk fever in that you have twitching of the muscles, the eyes blink when the animal is approached and there may be tetanic convulsions. I have not observed protrusion of the membrana nictitans' in bovines.

These cases respond fairly well to sedative and alkaline mixtures with a liberal supply of sugar.

Equine Tetany.—Professor Browne describes a condition known as equine transit tetany. I have observed two cases, one in 1912, which I describe as equine tetany (because neither had any connection with transit). The subject of the first case was a suckling mare which was affected following service by the stallion. The second case in a mare occurred after confinement in the stable and removal from the foal.

This condition is characterised by a very pronounced hyperaesthesia, twitching of the muscles, tetanic spasms, but an absence of protrusion of the membrana nictitans. The animals showed marked excitability. Treatment consisted of sedatives and full doses of purgative given by stomach tube; No. 1 received a subcutaneous injection of a saturated solution of magnesium sulphate. Both made an uneventful recovery.

Anaemia of Suckling Pigs.—With the introduction of the modern style concrete pig houses, this condition undoubtedly has become more common. It is one of the penalties which must be paid when mass production methods are introduced. Under the old system of pig keeping generally only one or two sows were kept and these wandered at will about the farm and even if the litters did not have access to pasture, the sow generally had enough mother earth adherent to her to supply the iron requirements of her litter. The McLean County system of swine sanitation was unknown and as "dirty as a pig" was a very true description indeed. The condition in my district is generally known as "blows" and we were very much in the dark regarding it until investigations by Mr. Lamont showed that it was an anaemia. Affected litters are often fat and stocky in type. Symptoms may appear at any time from the tenth day onward to the sixth week of life, that is during the purely suckling period of the pig's existence. The symptoms briefly are paleness of the skin, rapid jerky respiration—the so-called "blows" or "thumps"—and diarrhoea may be present. The age of the pig is a useful pointer in the diagnosis. In treatment I get excellent results from the following prescription: sulphate of iron ʒiii, sulphate of copper ʒi, aqua 0i. One teaspoonful of this mixture is given daily and in my experience this mixture, although it entails catching and dosing the piglets, is so much superior to udder paints, etc., that the extra trouble is amply repaid. It is very good, too, as a means of prevention, and where it is used regularly from birth, pneumonic troubles tend to disappear.

Pine in Cattle and Sheep.—I have been accustomed to meet with a condition in cattle which are known locally among cattlemen as "piners." The symptoms in cattle are that the animals are stunted in growth, the coat is rough and staring, and the animals have a general unthrifty appearance.

These subjects respond remarkably well to treatment with cupri sulph. and nux vomica so it would appear that parasitic infestation may be a factor in the causation of the condition.

Pregnancy Toxaemia or In-Lamb Ewe Disease.—I have met with this disease with my friend Mr. Lamont. The history, symptoms, treatment and prognosis are, in my experience, as stated by Professor Browne. Affected animals should receive plenty of exercise and a sparse diet.

Latent or Suppressed Sheep Scab.—I am very interested in this condition, because it was brought to my notice about two years ago by a lay inspector of sheep. I quite believe the soundness of the assertions made regarding

this disorder and would like to hear the opinion of others on this subject.

Acaprin in the Treatment of Redwater.—In my experience, acaprin is the most useful drug yet discovered for the treatment of redwater in bovines. *Piroplasma divergens* is the cause of the condition in this country. I have treated hundreds of cases with acaprin and the results are very satisfactory: the urine generally clears about 24 to 36 hours after injection. This agent is easily administered, quick in effect, the attack is cut short, convalescence is soon established and the percentage of recoveries is good. There is seldom any necessity for dosing with purgative and other medicinal agents, but fluids should be allowed *ad libitum*. Rephrin in bad cases may be used in conjunction with acaprin. The dose of acaprin is 1 c.c. to each cwt. of body weight with a maximum of 10 c.c.

I should just like to ask if one would be justified in giving a second dose in 24 hours if the urine is not clear, or if any bad results would follow after even a third injection. Personally, I have never had any alarming symptoms after injecting with acaprin.

Sterility.—This concerns the stockbreeder to an enormous extent in this country and the annual financial losses are very considerable. It is mostly seen in cows and occasionally in heifers. It may be associated with contagious abortion, but I say that by far the greatest number have no connection whatever with that condition. In 1928 Mr. Lamont collected blood samples from over 200 sterility cases in my district and less than 25 per cent. showed agglutination for *Br. abortus*.

For convenience I divide the cause of sterility in bovines under two main headings:—

(1) Metritis caused by bacterial infection;

(2) Sterility due to functional or structural alterations in the generative organs or a combination of both.

Naturally cows at grass would not suffer to any extent compared with those receiving concentrated foods and kept indoors for milk production.

Treatment consists in a manual examination of the entire generative organs *per rectum* and *vaginam*; all defects such as tumours, cysts, etc., in the vagina must be corrected and corpora lutea and cystic ovaries squeezed *per rectum*. If metritis exists, 5 oz. of a solution of 1: 500 iodine should be injected into the uterus; if the metritis is chronic or pyometra exists, the uterine injection should be repeated two or three times at intervals of three weeks. There are cases where the cow does not come in oestrum for months and where simple massage of the ovaries and uterus will result in oestrum coming on in about ten days.

During the years 1927-28 I treated 608 cows for sterility. Some were found suffering from metritis in all degrees of severity, some from functional and structural alterations in the generative organs: 440 of these calved normally; 165 proved barren, and the results of three were unknown. The animals were put to the bull at the second oestrum after treatment, excepting those that suffered from extensive metritis or pyometra, where copulation in cases of this sort was delayed. Since then I have treated on an average 300 cows per year and out of approximately 3,000 there was only one death, where haemorrhage took place from an ovary following the removal of a corpus luteum 32 hours after the operation.

The use of prolan for sterility in cows due to hormone deficiency has not given satisfactory results in my hands.

Eradication of Contagious Abortion.—I am greatly interested in this part of the subject because I happen to own a herd and there have been abortions nearly every year. The herd is not self-contained, new cows frequently being added to it. The entire generative organs are examined and the uterus injected with 5 oz. of a 1-500 iodine solution. The cow is served at the second oestrum and about a week later is injected with two doses of nator B (a dead vaccine) with a ten-day interval. When the cows are three months pregnant, two more doses of nator B are injected at a ten-day interval. Out of 60 cows treated in 1935, two aborted.

In conclusion, I should say that I feel honoured in being asked to open this discussion and tender my apologies if I have exceeded my time.

Mr. H. G. Lamont (Belfast) said that it was with some diffidence that he rose to speak on the subject matter of Professor Browne's excellent paper. It could truly be described as a practitioners' paper and he hoped that valuable information would result from it. They were all grateful to the essayist for collecting and making available that mine of information and it was obvious that he had done it with the thoroughness which they expected from Professor Browne. When he learned the title of the paper, he began to speculate on what would be included and what would be omitted; obviously everything could not be included, and he congratulated the essayist on his choice of subjects—a choice which should commend itself to the majority of practitioners.

Horses, cows and dogs probably formed the mainstay of veterinary practice, but there was a growing field for work in connection with pigs, sheep and poultry. Professor Browne and Mr. Hart had dealt fairly comprehensively with anaemia in pigs, but he should like to emphasise that anaemia, by its debilitating effects on the suckling pig, rendered it subject to a number of other diseases. He believed that certain pneumonic conditions could be considered as sequelae to anaemia.

While most practitioners were aware of the value of swine erysipelas antiserum for therapeutic purposes and the value of the serum vaccine method as a prophylactic, he did not consider it out of place to mention it in case some members had not used it. Occasionally it happened that one was asked to immunise pigs and there was a doubt in one's mind as to whether infection was present among the pigs

or not. The ordinary method of vaccination was risky and they had found that an initial dose of serum followed in six hours by the vaccine was both safe and satisfactory. That was contrary to the usual principle of vaccination.

The essayist had made reference to pregnancy disease or toxaemia. That condition was comparatively common in Northern Ireland, occurring principally in the heavier breeds of sheep. It was rather peculiar that at *post-mortem* examination there were generally two or more lambs *in utero*: it did not occur commonly in single pregnancies. Once sheep showed symptoms they seldom, if ever, recovered. In that connection he should mention—with the warning that one swallow did not make a summer—that he had an apparently miraculous result following the injection of 20 c.c. of polyvalent lamb dysentery serum. A sheep farmer in close proximity to Stormont had lost 13 ewes with this condition. When the fourteenth fell ill he sent her to the laboratory for research purposes. They did not happen to be investigating that disease and he must confess that it was purely an empirical procedure that 20 c.c. of lamb dysentery serum was injected. The ewe was walking around the box next day and the following day was completely recovered. It might be that that condition would prove to be an entero-toxaemia. He had treated no other cases, purely for the reason that none had presented itself.

They had had one case of lamb dysentery and the prompt administration of lamb dysentery antiserum at once stopped the loss.

Pulpy kidney disease was another example of a disease in lambs for which an antiserum was available. That condition was often confused with wool ball. In pulpy kidney disease the lamb, generally the best one in the flock and about two to five weeks old, was found dead or died after a few hours' illness. In true wool ball the lambs were generally noticed ill for several days with symptoms of indigestion. He should mention that at *post-mortem* examination some wool was generally found in the stomachs of most lambs. In pulpy kidney disease lesions would be noticed in the kidneys.

They were using pulpy kidney disease antiserum on farms where that disease had taken toll in preceding years, and should that prove to be a "pulpy kidney year" they hoped to be in a position to offer an opinion on the value of the serum as a prophylactic.

It was worth recording, too, that they had had a typical case of scrapie in Northern Ireland in sheep imported from the Scottish border. The principal symptoms were pruritus, loss of wool, loss of condition and fainting fits.

He should like to mention the value of certain organic arsenical preparations in the treatment of "blackhead" or entero-hepatitis in turkeys. Practitioners were occasionally asked about this disease and it was just as well to know that a useful treatment existed.

Professor Bowne had made reference to sterility in cattle. He desired to make one point, *viz.*, that many cases of that condition recovered spontaneously towards the autumn after enjoying the benefits of fresh grass and sunshine. It was a common observation in the springtime before the cattle were turned out to grass, that they had become very bare or poor in condition—a fact that would indicate that they had not been receiving an adequate ration. Such animals, in order to supply the needs of the developing calf and the owner's milk pail, must draw on their body reserves of minerals, protein, etc. A white, opaque and often relatively copious discharge was commonly noticed in this disease, at or about the time the animal was due to come in season. That symptom would indicate that the condition was in the nature of a chronic infection or catarrh. Iodine irrigations, after Nielsen, gave very good results, combined with appropriate feeding.

One in 1,000 euflavine had proved of service in their herds for the troublesome sterility which often followed abortion. The cow on which Professor Browne demonstrated at the Belfast Congress made a satisfactory recovery and was got in calf six weeks later. She looked a hopeless case at the time of treatment.

In conclusion, he would like to thank those responsible for the happy idea of a joint meeting of the two Associations and hoped that this would not be the last.

Mr. P. F. Dolan, Chief Veterinary Inspector, Dublin Corporation, having thanked the President for his paper, observed that there had recently been a quite considerable outbreak of grass tetany in County Dublin. He was greatly interested in the method described in the paper of getting medicine into the abomasum. With regard to the question of latent sheep scab, he had come across cases of this mostly in lambs and there was great difficulty in finding the parasite on microscopical examination of wool samples. Mr. Dolan concluded by saying that he was interested in the treatment of mastitis by gravity.

Mr. L. M. Magee, Dunboyne, Co. Meath, said as an unworthy representative of the practitioners he rose to thank Professor Browne for his paper and also Mr. Hart for the very able manner in which he opened the discussion. Recently he had a case of grass tetany and mistook it for milk fever and the case died. He had a second case, on the same farm, which he recognised as grass tetany. He used the calcium treatment and stimulants. Next day the animal was better but did not rise and there was a third cow down. The second cow died in five days and third cow died the next day. It was high time that means should be afforded there for the examination of blood and urine for pregnancy and also for the examination of blood in grass tetany cases. He would like to ask Mr. Hart whether he could throw any light on cases of milk fever in which the calcium treatment had failed, the injection of oxygen into the udder had failed and the injection of oxygen subcutaneously had failed. He had a case in which the animal sat up for a while after inflation of the udder with oxygen, lasted six days and died. With regard to acaprin, he found it a wonderful remedy for redwater, but if the case had been in progress for a few days it had little effect. He believed the bowels should be attended to. With regard to mares not coming in use, this was often due to the ovaries ceasing to function from some cause or other, *e.g.*, either they had become atrophied or cystic. If the ovaries were felt and squeezed oestrus often would result. He had a mare in which, on examination, the left ovary felt cystic and the right one cirrhotic and hard and massage brought her on all right. It was extremely difficult to burst cystic ovaries, either of the cow or mare, through the bowel. With regard to pine, cases had done well with a wineglassful of a saturated solution of copper sulphate given once a day. He had no opportunity of trying insulin in azoturia, but a colleague of his informed him that he had had very good results with this treatment.

Mr. R. J. Roe, Cyprus, observed, with regard to the treatment of sheep for fluke, that in Cyprus they had injected carbon tetrachloride direct into the rumen. They had found the capsules too expensive. At first when they started this treatment they injected 1 c.c. carbon tetrachloride with 3 c.c. liquid paraffin. Later they dropped the liquid paraffin. The routine procedure had now been carried out in thousands of sheep, using a 10 c.c. syringe and one-and-a-half inch needle and injecting 1 c.c. carbon tetrachloride direct into the rumen.

Mr. A. P. Harris, Cashel, said that he had used insulin with great affect in azoturia. He gave 100 units and repeated with a second dose of 100 units. With regard to the pregnancy test in mares, at present it was not of much service to stud owners as the test could not be taken for 60 days after service; moreover, sometimes one got an unsatisfactory result. It would be a good thing if that test could be taken 21 to 25 days after service. With regard to sterility, the veterinary profession was still backward in this matter. In many cases sterility was probably due to vitamin deficiency and the best cure was often to turn the animal out on grass.

Mr. J. J. Condon, Tipperary, stated that he had found good results to follow from calcium treatment in milk fever and eclampsia in cows. With regard to grass tetany, there was a big outbreak of this disease six years ago in County Tipperary. With the inflation treatment the majority of affected animals recovered. Concerning the use of acaprin, he found that it was an efficient agent. He had had a bull that had been given drastic physics, etc.; he tried acaprin with excellent results. Prolan, too, had proved of service, but it was slightly expensive. His results from the use of entozon had not been very good.

Professor O'Connor said he did not intend to discuss the subject matter of Professor Browne's paper, but he would like to congratulate and thank Professor Browne for bringing to their notice so many of the modern therapeutic methods. It would be a great convenience to have the paper for reference to these up-to-date measures.

He also wished to welcome the vistors from the North of Ireland and to thank Mr. Hart and Mr. Lamont for their very interesting and instructive contributions to the proceedings of the meeting. There were many of the past students of the Dublin College amongst their friends from the North and he was very glad to meet them again.

He did not think Professor Browne was right in saying that this was the first occasion on which a conjoint meeting of the Association of the North of Ireland and the Veterinary Medical Association of Ireland had been held, for he recollected at least one on a previous occasion and which was a great success. He hoped there would be many more such meetings.

Professor O'Dea commented that Professor Browne had managed to get a vast amount of information within a very limited space. The aetiology of many of the conditions dealt with in the paper was rather obscure and the mode of action of some of the agents was not well understood, but the matter was so carefully worded that there was little opening for criticism. There were some preparations the use of which might have been elaborated, for instance, tetanus alum toxoid, which must be a great boon in localities where tetanus was prevalent. At a small cost and with only two injections it was claimed that a permanent immunity was conferred. In hunting districts especially, an easily conferred immunity of that kind was particularly valuable. Omnadin was another preparation which the speaker found very useful in distemper and other febrile conditions. He would like to clear up a misunderstanding in the minds of some of the speakers with regard to the use of entozon. He had not recommended entozon for any condition other than chronic streptococcic mastitis. In that condition he had found it undoubtedly useful but he had no experience of its value in other conditions and he knew of no drug that was effective in the treatment of acute mastitis. Referring to milk fever, he believed it was most important to get the cow on her feet immediately full consciousness returned. Many cases of resulting so-called paralysis, which were so unsatisfactory to treat and sometimes ended fatally, were due to delay in getting the animal to rise. On the suggestion of his colleague, Mr. O'Brien, of Claremorris, he had for many years in practice given half a grain of atropine subcutaneously before leaving the patient, and since adopting that practice he had had a much smaller number of cases of prolonged decubitus. The late Wallis Hoare, who was one of the keenest observers the profession has known, also recommended atropine in this condition. He did not agree with one of the speakers that latent sheep scab was due to the inhibitory effect of the summer dipping on the parasite. It had been attributed by Downing to climatic or seasonal conditions and Downing's theory was supported by the fact that in mountainous districts, to which the disease was now practically confined, despite the autumn double dipping requirement the disease was much more in evidence during the winter months. Professor Browne had, to his mind, presented an excellent paper, one that was of interest to all members of the profession, especially to practitioners, and it was a singularly happy thought of his to select a practitioner of the eminence and experience of Mr. Hart to open the discussion. He was glad to see so many of their northern friends at the meeting that evening; he wished to join in a hearty welcome to them and he expressed the hope that the reunion would be an annual one.

Mr. J. D. Whitty, Department of Agriculture, Dublin, also extended a hearty welcome to the visitors from Northern Ireland, and gave a special welcome from the Veterinary Inspectorate of the Ministry of Agriculture to the Chief Veterinary Officer of the Northern Ireland Ministry of Agriculture and his inspectors. He cordially endorsed the hope that had been expressed that very many such meetings of the professional colleagues on both sides of the border would take place in the future.

Major A. Hodgins, Nenagh, stated that he had met with three cases of grass tetany in cows; the cows were down but were not comatose and he inflated them on several occasions. One cow got up on the eleventh day and the other two after 15 days. They had marked contraction of the flexor muscles and were knuckled over fore and aft. He also had a case of train tetany in a mare. He found the mare lying down and sweating profusely; although they got her on her legs, she went down again: she was then carried out to a paddock. He passed the catheter and emptied the bladder. With the stomach tube he gave half a pound artificial Carlsbad salts. He then used a blunt hypodermic needle and inflated the udder. In five minutes she struggled to get up and in a few minutes more she was up on three legs. Shortly afterwards she galloped down the paddock and before he had his hands washed she was feeding.

Mr. R. R. Pierse, Listowel, said he had got good results from the use of acaprin when used early. It shrivelled the piroplasms in the blood,

but if not given when the temperature was raised it had no action. With regard to hypophysin (extract posterior pituitary) he used 2 to 3 c.c. in cases of farrowing. It ensured quick delivery and prevented collapse in sows, while it was also of use in prolapse of the uterus, reducing the size of the uterus by one-half in five minutes and making reduction easy. He had met with grass tetany lately and used chloral hydrate and treacle treatment with good results. With regard to the treatment of open joints, he had found milk serum an excellent treatment. He injected once and got in as much as possible. There was severe pain for twelve hours and one got swelling of the joint and the discharge then stopped.

The Reply

Professor Browne thanked those present for the kind reception which had been given to his paper and for overlooking its many faults of omission and commission and thus letting him off so lightly, since his task of replying has been rendered a comparatively easy one. He wished particularly to thank Mr. Hart for coming there that evening—no doubt at great inconvenience to himself, for he (Mr. Hart) was a very busy man—and opening the discussion in such a lucid and able way. Mr. Hart had given them the benefit of his own varied and wide experiences and on that account his remarks were very high appreciated.

He wished to apologise for the scrappy nature of his paper. Considering the number of subjects he attempted to cover in the available time and space his paper could not be otherwise than scrappy. Not only was he obliged to deal with the subjects in a very superficial way, but he had had to cut out many important recent advances altogether. It might appear strange to write a paper of that description without even mentioning the recent and important achievements in the prevention and treatment of canine distemper, the recent work in regard to vaccination against tuberculosis, the liver-fluke treatment in sheep, or the treatment of leptospiral jaundice in the dog. Then again, as Mr. Lamont had pointed out, considerable advances had recently been made in the prevention of some of the anaerobic diseases of sheep such as braxy and lamb dysentery, and these had saved the sheep farmers in Great Britain from losses of many hundreds of thousands of pounds annually.

When listening to Mr. Hart and other speakers he had the satisfaction of feeling that the paper had achieved at least one of its objects since it had been the means of inducing Mr. Hart and others to record the presence of a number of diseases in Ireland which had not hitherto been recorded in published veterinary literature as existing in this country—Mr. Hart had, that evening, described the presence of lactation tetany, lambing sickness and equine tetany in Ireland, and Mr. Lamont had similarly recorded the presence of lamb dysentery, pulpy kidney and scrapie in sheep. Furthermore, pregnancy toxaemia in sheep, according to some speakers, was quite commonly met with. Despite the absence of references in the literature, however, he had been aware for some time through conversations with observant practitioners that some of those conditions existed there. The question had been asked that evening why some of those diseases should suddenly appear in this country within recent years, but it would appear that those conditions were not of recent origin, since they had been recognised in this country as soon as they had been looked for; therefore, it was not unreasonable to assume that they had hitherto existed undetected, having been mistaken for other similar conditions; in the case of sheep and lambs it must be confessed that those animals had, up to recent times, received very little professional attention.

When opening the discussion Mr. Hart implied that he had some doubts as the generally accepted theory regarding the causation of milk fever because occasional cases occurred at other times than during the period of most active milk secretion. In his (the speaker's) opinion these occasional occurrences did not upset the theory at all, because the formation of milk was merely a predisposing and not an essential factor in the production of the condition. The causation was simply a question of degree regarding the diminished activity of that mechanism which mobilised calcium from the skeleton to the blood, but as to what exactly controlled that mechanism they were not certain. Whether it was due to a relatively quiescent state of the parathyroids or not did not matter for the moment. As a result of that reduction in calcium mobilisation from the bones to the blood the blood calcium fell and should it fall below a certain point tetany or milk fever resulted. That danger point was of course most likely to be reached when calcium was being drained out of the blood into the milk during very active milk secretion, but it was only reasonable to assume that at times, for some unknown reason, that reduction in calcium mobilisation from the bones to the blood might be carried a stage further and thus reduce the blood calcium below the danger point even when no milk was being formed. It must be admitted by everyone that the great majority of cases occurred, as one would expect, at the time of highest milk production. They had some support for this contention in the case of lambing sickness in ewes, where the ewe suckled her lambs and where the udder was not suddenly drained out at comparatively long intervals. Here the symptoms did not necessarily occur soon after parturition, when the mammary gland was most active, but might be shown at any time; in fact, the condition usually occurred a considerable time after parturition, when the lambs had become sufficiently developed to empty the gland within a short space of time.

He had stated in his paper, with reference to staggers, that cases of ragwort poisoning (liver cirrhosis) might possibly be diagnosed as cases of staggers. Mr. Hart had agreed, but stated that ragwort poisoning was a very rare condition. That might be the case in Mr. Hart's district because it was possible that a plant might be more poisonous on certain lands or in certain districts than in others. When Professor Craig was investigating this condition he had been able to find quite a number of outbreaks not a great distance from Dublin. Most of those cases were traced to dried ragwort in the hay and it would appear that the dried ragwort was even more poisonous than the green plant on the pasture.

As regards lactation tetany it would appear from what Mr. Dolan had said and from Mr. Hart's experience that this condition was not uncommon in Ireland. In Great Britain most cases of lactation tetany died, but Mr. Hart appeared to have been more successful with his cases, using sedatives, alkaline mixtures and sugar.

Mr. Hart had also met with cases of equine (transit) tetany in this country and these were cases of suckling mares which had been subjected to sudden confinement in the house. On that account Mr. Hart would suggest

omission of the term "transit," but in Great Britain most of the cases had been met with during or immediately after a long railway journey and that could not be expected to be the case in a small country like Ireland where the railway journeys were very short. Harvey in England had recorded cases similar to those of Mr. Hart.

He (the speaker) was interested to learn that Mr. Hart had had considerable success from the administration of large quantities of sugar in the treatment of blood-calcium deficiency diseases, because there was some justification for the use of sugar in those cases. For some time before the discovery of blood-calcium deficiency in milk fever the cause of the latter disease was believed to be hypoglycaemia or a reduced sugar content in the blood, since the blood sugar was below normal in that condition. Furthermore, it was shown that the sugar content of the blood rose as the result of inflation of the udder; it was later discovered, however, that this rise in sugar in the blood was due to milk sugar (lactose) which had been forced into the blood from the udder and that there was no actual increase in true blood sugar (glucose).

All the speakers that evening were unanimously of opinion that acaprin was specific for the treatment of redwater provided it was administered early in the attack and one speaker had said that a second or even a third dose might be given should the first not prove effective.

Mr. Hart had stated that the *Babesia divergens* was the sole cause of redwater in Ireland, but he (Professor Browne) was of opinion that sufficient samples of blood from different parts of the country had not been examined to justify that statement. However, from the evidence available up to the present it would appear that this parasite was by far the more common one.

It was evident from Mr. Hart's remarks that he had had considerable experience in the treatment of contagious abortion and sterility. He had been experimenting with different types of abortion vaccine and he had told them that he treated on an average 300 cases of sterility in cattle yearly. Unfortunately time did not permit Mr. Hart to go into detail regarding his experiences in those conditions. He (the speaker) would take the liberty of suggesting that the two Associations met there that evening might have the privilege at a later date of hearing Mr. Hart on that interesting and important subject.

ARE VIRUSES ALIVE?

"When W. M. Stanley announced two years ago that he had isolated from Turkish tobacco plants infected with mosaic disease a crystalline protein having the characters of the virus, the majority of virus workers received the news with a certain scepticism," states *The Lancet* in a recent leading article, and continues: "Their doubt did not concern the facts but their interpretation, for it seemed possible that the virulence of this crystalline preparation was due not to the protein but to mosaic virus present as an impurity. Stanley himself, who all along has shown commendable caution in interpreting his findings, clearly envisaged this possibility. Since then events have moved rapidly. His observations have been repeated and confirmed in this country, Bawden and his collaborators at Cambridge having isolated an identical protein from diseased Burley tobacco plants. Stanley has further obtained the same high-molecular-weight protein from spinach and phlox plants infected with tobacco mosaic virus and Beale has had similar success with petunia plants. In every case the crystalline protein was highly virulent.

"The fact that the same peculiar crystallisable protein has been obtained from such divergent species of plants as phlox and tobacco and that a solution of this protein has always proved virulent in high dilution, is strong evidence in favour of Stanley's view that this protein is the virus. But there is more. Tobacco mosaic virus has a number of variants each of which produces symptoms differing from those that characterise infection with the parent strain; and from Turkish tobacco plants infected with three of these variants—the yellow, the masked or symptomless, and the single-lesion mosaics—Stanley and Loring have obtained heavy proteins which, though obviously related to Stanley's original preparation, have characteristics, both physical and chemical, that distinguish them from it and from one another. Thus when mosaic virus mutates the change is associated with a change in the protein which the variant produces in the plant that it infects. And when one adds that Stanley has been unable to separate the heavy protein from a hypothetical virus impurity and that he has also shown that change produced in the protein is associated with a corresponding change in virus activity, it is not easy to object to his conclusion that this high-molecular protein is the virus. A further advance comes from the work of Bernal and Fankuchen who have been investigating at Cambridge the structure of these crystalline proteins by means of X-ray photography and optical methods. They confirm their previous opinion that Stanley's crystals are of a liquid crystal nature; they find that though the crystals of different mosaic viruses show the same intramolecular pattern there are significant differences in intermolecular pattern and they suggest the possibility of classifying these viruses on the basis of X-ray pattern.

"It is difficult, then, to escape the conclusion that these heavy proteins are the virus. But since they can be obtained in a crystalline form without loss of activity they appear to belong to the non-living world. How are we to reconcile this with the ability of viruses to multiply and to cause contagious diseases that spread like diseases due to living micro-organisms, and their ability to give rise to variants? But can there really be any sharp dividing line between the living and the non-living? As one passes downwards in the scale of living things a point must be reached at which it is extremely hard to say whether one is dealing with the animate or inanimate, and it is possible that in the no-man's land between the two worlds agents will be found, like these viruses, which partake of the characters of both. As Stanley says, the enormous size of the molecules of these virus proteins may allow of sufficient complexity of structure for them to behave in some respects like living organised beings. How many viruses will prove eventually to be of the same nature as these plant viruses it is impossible to predict, but already evidence is adduced that one at least of the animal viruses—that of the Shope rabbit papilloma—is a heavy protein. It seems fairly safe to assume, on the other hand, that the large animal viruses, like the virus of psittacosis and the viruses of the pock diseases, are more highly organised agents belonging more definitely to the living world."

Experimental Tuberculosis in Field-Voles and Mice

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The discovery by Wells (1937) of an epidemic disease among field-voles (*Microtus agrestis*) due to acid-fast bacilli has aroused much interest and prompts me to put on record some experiments on these animals with tubercle bacilli which I did in the year 1923. In that year ten voles were caught in a paddock adjacent to my laboratory and were used for inoculation, some with bovine and some with human tubercle bacilli. At about the same time eight wood-mice (*Mus sylvaticus*) were caught and these, together with 18 white mice, were also inoculated with bovine and human bacilli for the purpose of comparing the susceptibility to tuberculosis of these two species of mice with that of the field-vole.

The results in voles with human tubercle bacilli were irregular and did not enable one to draw final conclusions regarding the relative virulence of bovine and human bacilli for this species. For this reason, and also because it was desired to test the susceptibility of the vole to avian bacilli, publication of the results was deferred until further experiments could be made. Unfortunately no more voles were caught in the next few years and then other work intervened.

Experiments of Field-Voles

Three voles were inoculated subcutaneously with culture of bovine tubercle bacilli, one with 0·5 mgm. and two each with 1·0 mgm.

They died in 47, 47 and 48 days respectively of generalised tuberculosis. Each showed at the seat of injection an ulcerated caseous infiltrating lesion; in two voles the infiltration extended into the groins and round the brim of the pelvis to become continuous with the enlarged caseous iliac glands. The inguinal, lumbar and manubrial glands were also enlarged, caseous and softened throughout. All other lymphatic glands were affected, but to a less extent. The spleen in two voles contained small caseous tubercles and that of the third was composed practically throughout of whitish, friable, caseous substance. The liver of one vole showed two or three pinhead tubercles; in the others this organ seemed free. The kidneys contained from one to ten caseous tubercles. The lungs of all three voles were affected; in one about half the lung was replaced by firm caseous substance; in the other two there were scattered greyish- or yellowish-white lesions, ranging from 1 to about 3 mm. in diameter. There was a tubercle in the heart muscle of each of two voles. In one vole the somatic muscles showed tubercles, and three joints (two knee and an elbow joint) were enlarged and caseo-necrotic. All the lesions contained tubercle bacilli in great abundance.

Seven voles were inoculated subcutaneously with two strains of human bacilli, three voles with one strain and four with the other, the dose in each instance being 1·0 mgm.

Two died in 20 and 30 days and showed nothing to the naked eye beyond a small collection of pus at the seat of injection. Bacilli were, however, moderately numerous in the glands and organs.

One died in 70 days and all the organs were consumed by companions except one kidney, which showed, microscopically, moderately numerous tubercle bacilli.

One died in 77 days and no lesions or tubercle bacilli were found.

One died in 101 days and showed two small patches of congestion in the lungs (t.b. +) only.

One died in 284 days; a small local ulcer and some small thin-walled abscesses were found in the subcutaneous tissues of the groins (t.b. numerous) and nothing elsewhere.

The remaining vole died in 235 days of general tuberculosis. *Post-mortem.* — Caseous ulcer in left groin; caseous glands in right groin, right axilla (ulcerated), left axilla, along iliac vessels, and in lumbar regions and each posterior triangle. One submaxillary gland contained a tubercle. Kidneys contained a good many caseous tubercles, mainly in the depth. Spleen and liver appeared normal. Lungs: both caudal lobes enlarged and caseous throughout; left cephalic partly caseous; right cephalic two caseous nodules.

Tubercle bacilli were extremely numerous in the glands and lungs, numerous in kidney tubercles and moderately numerous in the spleen pulp.

Experiments on *Mus sylvaticus*

Six of these mice were inoculated with culture of bovine tubercle bacilli, two intraperitoneally and four subcutaneously, each receiving 1·0 mgm. of culture.

Of the former, one died in eight days of red hepatisation of the lungs; tubercle bacilli were very numerous in all the organs. The other, dying in 24 days of general tuberculosis, showed tuberculous peritonitis, spleen enlarged, firm and greyish-white, minute grey points in liver and numerous grey foci, 0·5 to 1·0 mm. in

diameter surrounded by red hepatised tissue in the lungs. Tubercle bacilli were extremely numerous in the lesions.

The four subcutaneously inoculated mice died in 60, 119, 152 and 168 days respectively. In each there was a local caseous lesion without any enlargement or caseation of the adjacent inguinal glands; the lungs in each instance were enlarged and extensively consolidated, the condition varying from red hepatisation with some grey areas to almost complete firm greyish or greyish-white consolidation. The abdominal organs showed no macroscopic lesions. Tubercle bacilli were extremely numerous in the lung and sparse or not found in the liver and spleen.

Two mice were inoculated subcutaneously with a culture of human type, each receiving 10·0 mgm. They died in 51 and 115 days of pneumonic consolidation of the lungs (red hepatisation), those of one showing here and there a pin-point opaque white spot. Except for a small local lesion in each there was no other sign of tuberculosis. Tubercle bacilli were extremely numerous in the lungs, liver and spleen of the first mouse, moderately numerous in the lungs and sparsely scattered in spleen, liver and marrow of the second mouse.

White Mice

Seven mice were inoculated with cultures of bovine tubercle bacilli, two intraperitoneally (dose 1·0 mgm.) and five subcutaneously (two with 1·0 mgm. and three with 10·0 mgm.).

Of the two former one died in 58 days and showed a slightly thickened omentum, an enlarged spleen and almost complete red hepatisation of the lungs. (T.b. numerous in lungs, sparse in spleen, liver and inguinal glands.) The other died in 206 days, the lungs showed a number of greyish-white patches with well-defined margins. (T.b. moderate in lungs and not found elsewhere.)

Of the subcutaneously inoculated mice four died 94 to 206 days later. In one (10·0 mgm.) there was no sign of tuberculosis but tubercle bacilli were present in moderate number in the inguinal glands and in small number in the organs. In three there was no or very slight local disease; the lungs of two contained greyish-white nodules and in the third were consolidated and in a condition of red hepatisation, showing irregular greyish-white or slightly yellowish areas. T.b. were numerous or moderately numerous in the lung lesions and scanty or not found elsewhere.

The remaining mouse (dose 10·0 mgm.) was killed 353 days after inoculation and showed a pinhead yellow focus in the subcutaneous tissues and consolidation of the lungs, which were composed of firm greyish-white patches and red hepatised tissue (t.b. + +).

Eleven mice were inoculated with cultures of human bacilli, four intraperitoneally and seven subcutaneously. The four (intraperitoneal) died in from 13 to 80 days. In the first there were no macroscopical lesions, but tubercle bacilli were moderately numerous in the organs. The rest showed in the abdominal cavity thin-walled cysts containing pus largely composed of tubercle bacilli. In one mouse there were a dozen of these cysts, which together weighed 650 mgm. The lungs of two of the mice were congested and showed grey or greyish-white areas (t.b. + + +).

Of the seven subcutaneously inoculated mice four (dose 1·0 mgm., duration of life 87 to 151 days) showed no disease and tubercle bacilli were not found in the organs and only a few in the inguinal glands of one.

Three received each 10·0 mgm. and died in from 109 to 213 days. One had an abscess with thin wall in the liver (t.b. very numerous) and two small grey areas in the lungs. Another had a thin-walled abscess in the abdominal cavity (t.b. very numerous) and no sign of disease elsewhere. The third showed scattered grey tubercles in the lungs only (t.b. + +).

Discussion

More than 50 years ago, "at the very dawn of the study of tubercle bacilli" (Cobbett), Koch in his fourth experiment with culture (strain 11 from the tuberculous lung of a monkey) inoculated six white rats, five white mice, four field mice (*Arvicola arvalis*), one marmot, two guinea-pigs and some birds and cold-blooded animals.

Of these animals only the guinea-pigs, the marmot and the field mice became visibly ill. They were killed 53 days after inoculation and were all found to be highly tuberculous.

Tuberculosis in the marmot (*Mus montanus*) apparently resembles very closely tuberculosis in the guinea-pig; the spleen is much enlarged and has a greyish-red mottled appearance; the liver also is beset with large yellowish foci.

"In the field mouse the organs that have undergone tuberculous changes have a very characteristic aspect, too. The inguinal glands are markedly swollen and caseous; the lungs full of grey nodules from a poppy-seed to a pin's head, while many whitish nodules as large as a millet seed are distributed throughout the liver and spleen, so that they have a very pretty speckled appearance." In another experiment 24 field mice in groups of four were inoculated subcutaneously, each group with a different strain (five of human and one of bovine origin); and in a third 24 field mice were inoculated subcutaneously with a culture from a phthisical lung. Several of the 48 mice died in a few days. In all the others tuberculosis developed and ran

the same course as in the mice in the previous experiment. The autopsy showed in every case tuberculosis of the lungs, spleen and liver.

For comparison 17 white mice were inoculated subcutaneously. They were killed two months later and only one showed a tuberculous lesion—a grey nodule in the lung.

After Koch, many observers have tested the susceptibility of the white mouse to tuberculosis. The results of the experiments have shown that white mice can be infected with each of the three types of tubercle bacilli (human, bovine and avian) by any method of inoculation and by feeding and inhalation. Relatively large doses are, however, necessary to cause with any certainty general progressive tuberculosis, which is, moreover, often very chronic in its course. Of the three methods of inoculation the intravenous is the most and the subcutaneous the least to be relied upon to cause progressive disease (Lange, Topley and Wilson). Small doses by any of the methods, particularly the subcutaneous, frequently fail to produce a progressive infection (F. and A. S. Griffith, 1907 and 1911). White mice appear to differ in individual susceptibility and, as F. Griffith (*loc. cit.*) has remarked, "sometimes recover after the inoculation of a dose of (avian) culture which at another time produces a fatal result."

The pathogenic effects in different mice receiving the same dose by the same route are often very diverse. When relatively large doses —1 to 10 mgm.—are inoculated intravenously or intraperitoneally the bacilli multiply freely in the tissues and may cause death without setting up macroscopic lesions. But usually characteristic tuberculous changes are found in the lungs, which contain a variable number of grey or greyish-white foci or small tubercles, or are almost entirely consolidated and composed of red hepatised tissue mottled with firm grey or greyish-white areas. The spleen often shows a variable degree of enlargement, but this organ and other abdominal organs rarely show macroscopic lesions. In chronic avian infections the liver and spleen may show small tubercles or nodules and avian bacilli are sometimes present in the lesions in even vaster abundance than is the case in severe mammalian infections. The bacilli multiply mainly within newly formed epithelioid cells, which eventually they replace, and have no toxic action. Weber and Bofinger (1904) remarked that the organs of a mouse which has died of avian tuberculosis appear sometimes to consist for the most part of tubercle bacilli. There are, however, no constant differences in the reaction of the white mouse to the three types of bacilli and this species is therefore of no use for type-determination.

The only experiments which have been reported on another species of field rodents since 1884 are, so far as I am aware, those of Korns and Lu (1928). These workers used the striped hamster (*Cricetulus griseus*), a small field rodent of the family Muridae, which normally inhabits ground burrows, and found it to be more easily infected than the white mouse, using both bovine and human strains. The lesions in this animal are smaller than in the guinea-pig, with less caseation and but slight tendency to giant-cell formation. The lungs usually show pellucid tubercles of pinpoint to pinhead size on the surface; the tracheo-bronchial glands and spleen are enlarged, often greatly. Tubercle bacilli are usually found in abundance in the lesions and it is often possible to demonstrate them in an inguinal gland two to three weeks after subcutaneous inoculation of material which was negative for tubercle bacilli microscopically. For this reason the authors suggested that the hamster might be used—in China and elsewhere —for the diagnosis of certain forms of tuberculosis.

My experiments on field-voles showed that these animals are highly susceptible to bovine bacilli and that they can also be infected with human bacilli, though apparently with less certainty than with bovine bacilli. Further experiments with human strains are necessary (and are now in progress) before final conclusions can be drawn as to the relative virulence of the two types for the vole.

A point of similarity between tuberculosis in the vole and in Koch's field-mice is the great enlargement, with caseation, of the lymphatic glands, which are not affected in this way in the wood-mouse or the white mouse.

The pulmonary lesions in voles differ from those described by Koch in the field-mice used by him and resemble those produced in wood-mice. The latter species stands in an intermediate position between the vole and the white mouse in its susceptibility to mammalian bacilli.

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The Veterinary Record
August 7th, 1937.

The Association and the Minister for Agriculture

UPON two occasions recently representatives of the Association have had the pleasure of meeting the present Minister for Agriculture and Fisheries, firstly when he received a small delegation headed by our immediate Past-President, Captain Simpson, and secondly when a much larger gathering of members of the Association were able to welcome Mr. Morrison as their chief guest at the Annual Banquet recently held during Congress week at Bournemouth. Each of these events is notable in the Association's history for, in the first, the Association's representatives have at last been received directly by the Minister himself for the purpose of discussing matters of importance to the profession and in the second, the Minister of Agriculture and Fisheries has for the first time personally attended in his official capacity the most important annual function of the Association.

The Association, by its ever-increasing activities of recent years, has given abundant evidence of its immense growth in importance and power but it has fallen to the lot of Mr. Morrison to be the first Cabinet Minister to acknowledge this fact both officially at his own Ministry and to some extent socially at the Annual Banquet. We may rest assured that these acknowledgments, together with the mutual understanding thereby created, will have a beneficial effect upon the future work of the Association as well as upon that of the Ministry concerning matters veterinary.

The text of the Minister's speech at the Banquet will be given in our Congress Number, to be published on August 21st, and our readers will readily appreciate the importance of its subject matter, despite the appropriate seasoning of wit. The Minister was wise to acknowledge at the outset of his remarks upon the new Centralised Veterinary Service and the Government's campaign against animal disease that their object cannot be attained without the full co-operation of the profession. This co-operation the Minister may be assured will be readily given as long as the Association's advice is fully considered. The Association has gladly acceded to the Minister's suggestion that a special committee of the Association should be formed with a view to keeping in as close touch as possible with the Ministry during the development of its long-term policy. Differences do exist between the policy of the Association and that of the Minister, but these differences, although not forgotten, need interfere little with full co-operation between the two bodies in the main campaign ahead.

We gladly note that the Minister assured his listeners that in the new State Service "the experience, qualifications and present salary of each man will be very carefully considered with a view to fitting him into the machine where he can work with credit to the whole enterprise and with, I hope, great happiness to himself." With this assurance, we may expect that the great specialised services of the Local Authorities will not be lost in the new State Service. Again, to those of us who have long felt the need for some official announcement upon the place of the practitioner in State Services, the Minister's reference to him will bring much comfort. To quote from the speech: "The private practitioner, I hope, will continue to flourish in the country districts. Mine is no desire to magnify a State Service at his expense."

For many months now the Association has insisted upon co-operating with all where co-operation was offered and with the further pursuance of this policy between it and the Ministry of Agriculture we may confidently expect a continuation of the success which has recently been attendant upon the activities of the Association. We would wish that other Ministries, such as the Colonial Office, would realise before it is too late the value of such co-operation.

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Animal Diseases in Relation to Human Medicine

IT is an excellent discipline to examine the motives of our actions and, as members of a profession which has other functions besides the purely disinterested prevention of pain and disease, we should ask ourselves what other reasons we have for our work, and exactly how it contributes to human welfare. It has long been obvious that the health of animals is to man's economic advantage, and it is being

more and more realised that many human diseases are transmitted by animals and that animals may be a reservoir of infection. Thus, the veterinary art serves mankind from the viewpoints of economics and of human health. The former is constantly stressed; it will help to balance our outlook if the aspect of human health be considered.

The human population may contract diseases from animals either directly, or by handling or consuming animal products. With the group of diseases transmitted by direct contact, some progress has been made. We pride ourselves on the rarity of human cases of glanders, rabies, and anthrax, and only a small section of the population is liable to come in contact with such diseases as psittacosis and leptospiral jaundice. Danger from indirect infection, on the other hand, is widespread; the consumption of food and drink of animal origin means that a much greater public may be running risk of infection. The conveyance of tuberculosis and undulant fever by contaminated milk is continually reported, and annotations dealing with milk-borne outbreaks of septic sore throat, scarlet fever, enteric fever and dysentery have appeared in this journal recently. The dangers inherent in an inadequately controlled meat supply and the occasional danger from infected ducks' eggs are also well known. To protect the public from diseases such as these is one of the functions of the veterinary profession, which is qualified by specialised training to deal with the danger at its source.

Our service to mankind, then, extends to a direct protection from some of the ills from which he suffers. Let us include in our study and control the diseases, not of domesticated animals only, but of wild animals too. This would entail even more service and we support the implied plea made recently in the *British Medical Journal* (June 5th, 1937. p. 1165), in a leading article on tuberculosis on voles: "It might have been supposed that the common diseases of our principal fauna were well known, but we may now wonder whether there are not other species, especially among wild animals and perhaps birds, whose entire pathology is an unexplored field. It is hardly likely that any animal will be found to rival the rat in its capacity for transmitting a variety of diseases, nor will many afford discoveries of such general interest as the infective tumours of wild rabbits recently brought to light in America, but these examples will serve to show what may lie hidden in a territory which seems to have been neglected."

ANNOTATION

Tuberculosis in Wild Voles

The field or meadow-vole (*Microtus agrestis*) has been known for many years to be subject to remarkable fluctuations in population. From time to time its numbers increase prodigiously and enormous damage may be caused by "vole-plagues" in certain localities, especially in newly afforested areas and among growing crops. Predatory enemies, such as owls, rooks and weasels, thrive meanwhile. After a time the vole population suffers a rapid decline and may almost disappear. Even under average conditions, however, the numbers of this shy and cautious little animal inhabiting meadow land must be very large. The numerous interlacing "runs" made by it beneath the surface of pastures and moorland are familiar, its food consisting entirely of roots and young leaves and buds.

For some time, the cause of these recurring ups and downs in the vole population has been the subject of study by Elton and his colleagues at the Bureau of Animal Population in the University of Oxford. It was believed that the periodic disappearance of the "vole plagues" could best be explained by the rapid spread of epidemic disease among the little animals. In the laboratory it had been found that voles were highly susceptible to a number of virus and other diseases affecting man and the larger animals; for example, they could readily be infected with the virus of foot-and-mouth disease by inoculation, but this disease was not found to spread among them by contact. No infective agent had been discovered in the specimens examined that seemed likely to be the common cause of naturally occurring epidemics.

A preliminary note recently published by one of Elton's fellow workers* gives results which are surprising and have evoked widespread interest. Voles, both dead and alive, were examined from areas in Scotland, Wales, and England, which were uncultivated and fenced off from domestic animals. Since February, 1937, 134 voles have shown macroscopic tuberculosis with advanced, extensive, caseating lesions in the viscera and subcutaneous tissues, in which large numbers of acid-fast bacilli were found. The bacilli produced fatal disease in guinea-pigs and non-fatal disease, but with large local lesions, in rabbits. The results of further work upon the typing of the organism are awaited. Dr. Wells concludes that a disease presumed to be tuberculosis is present in wild

*Wells, A. Q. (1937.) *Lancet.* May 22nd. 1. 1221.

voles; moreover, the finding that the disease is widespread in the British Isles suggests that this was not a chance infection.

The significance of this reported discovery will not be lost on veterinary workers, concerned as they are at the present time with the eradication of tuberculosis among farm stock as one of their chief problems. It is clear that we must await the definite identification of the acid-fast bacillus and the results of the extensive field work that must now be carried out to determine the distribution and frequency of the disease among voles, especially on farm lands. The records published in this issue of careful experiments carried out several years ago by Dr. A. S. Griffith show, at any rate, that the vole is highly susceptible to infection with the bovine type of tubercle bacillus by inoculation. It is clear, too, from this and other reports that are now forthcoming, that the veterinary pathologist must considerably extend the scope of his work by taking under his close scrutiny the diseases that may be present in our abundant wild fauna if we are not to miss tracing to their sources some of the commonest diseases of our farm animals. Among the most significant recent disclosures in research into foot-and-mouth disease has been the high susceptibility of the hedgehog and the possible rôle of this common wild animal in harbouring infection.

It had been stated on high authority (A. S. Griffith, 1930) that tuberculosis in warm-blooded animals living wholly in the wild state was unknown, although when they are kept in captivity, as in zoological gardens and other institutions, tuberculosis is very common among them and is one of the chief causes of mortality, this being a consequence of the conditions under which they are kept.

The disease is one which has been taken to be the concomitant of overcrowding in the human subject and the similar state brought about by intensive domestication among animals. The recent surveys carried out in tropical countries (India, Uganda) where climatic conditions operate so that there is no need to crowd cattle under shelter, have disclosed, however, a surprisingly high incidence of infection, with only slight lesions, and it is possible that more rigorous scrutiny would reveal the presence of tuberculous infection to be more widespread than has been suspected among wild animals living similarly in the open. One may speculate that voles after they multiply in the enormous numbers which they reach at the summit of a "vole-plague" live in their natural habitats in conditions of overcrowding similar to those in which are kept the domesticated species in colder climates, and that such conditions are ideally favourable for the intensification of morbidity. It would, of course, be idle to speculate further upon the facts made available by Dr. Wells. Such as they are, they have caused the *British Medical Journal*, in a leading article on the subject of our note, to utter, "In the meantime, we may reasonably ask ourselves whether disease in animals is being adequately studied in this country." Coming at this late hour, after the necessary public support to prosecute this endeavour has been clamoured for in vain for generations in this country, this well-meaning utterance will no doubt sound strangely naïve to our veterinary readers.

J. T. E.

CLINICAL COMMUNICATION

Tuberculosis of the Penis in a Bull

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According to W. L. Williams[1] tuberculosis of the glans penis in the bull is not very rare and he notes that he has observed two cases clinically, one of which he describes; others he has observed in the abattoir.

It is not obvious to what extent it occurs in this country, but records of such cases are difficult to find.

A specimen of this kind was recently forwarded to the Department, together with the testicles, by Mr. Clayton, M.R.C.V.S., Birkenhead. They were obtained from an aged Hereford bull which had been imported from Ireland and slaughtered at the abattoir.

The information with regard to the carcase was that the bull was affected with advanced tuberculosis, lesions having been found in the parotid and pharyngeal lymphatic glands, the lungs (extensive caseous bronchopneumonia), the bronchial and mediastinal glands, the liver, hepatic and mesenteric lymphatic glands, the kidneys, iliac, popliteal, suprascapular and intercostal glands.

The peritoneum and pleura were unaffected.

The free extremity of the penis (Fig. 1) including the glans for a distance of about three inches, was diffusely thickened, reddened and dotted with dark-red spots and irregular in outline. On opening up the urethra a small round nodule was seen to project into the tube at the glans penis. When the penis was split dorso-ventrally along its length in the middle line (Fig. 2) a great deal of new tissue was found in the subcutis of the penis in the enlarged portion but not involving the corpus cavernosum. For the most part this new tissue appeared like red granulation tissue with small grey areas distributed through it. Two small

Fig. 1.—Tuberculosis of glans penis.

caseous nodules were present over the anterior portion of the corpus cavernosum.

Sections were prepared from the affected parts and examined microscopically. The new tissue was in large measure cellular, but new fibrous tissue was distributed as a lacework through the section. There were imperfections in the overlying epithelium.

The cellular part of the tissue was composed of epithelioid cells and some lymphocytes, and giant cells were fairly numerous. At a few points necrosis was commencing.

The mycobacteria of tuberculosis were readily identified in single rods and small masses through the tissue, but none were found in the giant cells.

The testicles presented a few small yellow areas suggestive of necrosis. In sections these areas proved to be actually necrotic and calcifying. They were sharply marked off and contained none of the changes associated with tuberculous lesions and no acid-fast organisms were found in them.

The origin of infection of the penis in the bull may be attributed to one of two sources:—

Fig. 2.—Same penis split dorso-ventrally, showing the distribution of the new tissue.

(1) direct infection through an abrasion during service of a cow the subject of uterine tuberculosis, and

(2) transference of the infection through the blood stream or through other channels from some other lesions in the body.

In this specimen it would be difficult to combat the view that the second method of involvement of the penis had actually operated. One could only be certain of primary tuberculosis if the penis alone or in association with the neighbouring tissues and lymphatic glands was the only organ showing lesions in the body.

It is possible that bulls affected in this way may be a serious source of damage to cows during service and indeed vulvar tuberculosis in cows has been traced by Rohrer[2] to two bulls, one with lesions in the testicles and penis in association with generalised tuberculosis, and the other with tuberculous lesions only in the prepuce and penis.

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[1]Williams, W. L. The Diseases of the Genital Organs of Domesticated Animals. 1921. p. 324.

[2]Rohrer, H. *Berl. Tierärztl. Wschr.* **51**. 9. Feb. 22nd, 1935. p. 115.

ABSTRACTS

[**Stifle Injuries.** Schroeder, E. F., and Schnelle, G. B. (1936.) *North Amer. Vet.* **17.** 3. 43-53.]

This article deals in general with the causation, diagnosis, prognosis and treatment of the various forms of stifle injury met with in the dog. In effect, however, it constitutes a claim for the employment of the Thomas splint for the total immobilisation of the limb in all cases in which treatment by splintage is indicated. The technique of its application and use is given in considerable detail and supported by several illustrations. The author favours the total fixation of the stifle in cases of fracture and his records show that in one case only has anchylosis resulted.

The article includes a detailed account of the surgical anatomy of the stifle joint and of the indications of the various forms of dislocation and rupture. Mention is made of the limitations of X-ray examination in diagnosis and of the necessity for careful preliminary physical examination in all cases, made under a sedative or general anaesthetic where necessary.

C. D.

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[**Preliminary Report on the Artificial Insemination of Merino Sheep in South Africa.** Quinlan, J., Mare, G. S., and Claassens, C. C. (1936.) *J. S. A. Vet. Med. Ass.* **7.** 86-105]

In a general consideration, the advantages and limitations of artificial insemination are indicated. It would appear that in South Africa the procedure has little economic advantage for normal breeding. In the experiments reported semen was collected in one of two ways: either by allowing the ram to serve a ewe with subsequent withdrawal of the ejaculum from the vagina by means of a glass pipette, or by the use of an artificial vagina (Cambridge type) fitted to a dummy sheep. Tyrode's solution or GPS-8 were used as diluents. The technique of insemination was that described by Walton (1933). The most satisfactory results were obtained when the semen was used 15 to 30 minutes after ejaculation. Under the conditions of the experiments artificial insemination gave almost as high a percentage of impregnation as did service in the normal way—47·5 as against 57·5—but at least four times as many females could be impregnated from the same number of ejaculations.

N. J. S.

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[**Starch Digestion in the Dog.** Ivy, A. C., Schmidt, C. R., and Beazell, J. (1936.) *North Amer. Vet.* **17.** 4. 44-46.]

The authors note that there has been disagreement between workers as to whether or not dogs can tolerate a high carbohydrate diet, while clinical observers agree that such a diet is unfavourable to health. They found that a series of dogs fed on a 62 per cent. starch diet were capable of digesting the whole amount as shown by quantitative measurements of the faeces. Excision of the pancreas reduced starch digestion considerably, an effect which could be counteracted by the giving of malt amylase by the mouth (50 g. per day). The authors suggest that the ill-health resulting from high starch diets is not due to the carbohydrate content but to the lack of protein and vitamins.

P. S. W.

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[**A Study of Starch Digestion in Hospitalised Dogs.** Brown, R. L., and Wood, M. (1936.) *North Amer. Vet.* **17.** 4. 46-49.]

An examination of a faecal sample from each of 100 dogs, 75 suffering from illness and 25 normal, was made by adding Lugol's solution to diluted faeces and examining for undigested starch grains. The diets were not constant for all dogs, but it appears that 22 per cent. of those in ill-health excreted starch, while only 12 per cent. of the normal dogs did so. It is noticeable that in the list of disorders given as those from which dogs yielding starch in the faeces were suffering, all are of the alimentary tract, while the infections of dogs in the "illness" group which did not yield starch are mainly non-alimentary.

Though the authors conclude that age, sex, breed and body temperature have no effect on starch digestion they give figures which show that starch was found in the faeces of 29 per cent. of the males examined against 11 per cent. of the females, and in 30 per cent. of those over one year against 16 per cent. of those under one year.

P. S. W.

THE PROPOSED NATIONAL VETERINARY SERVICE

Sir Merrik Burrell, Chairman of the Royal Veterinary College and of the Committee on Animal Diseases, recently addressed the Conservative Agricultural Committee of M.P.s at the House of Commons and gave strong support to the Government's animal diseases policy, which involves the setting up of a national veterinary service and will mean a big campaign to eradicate diseases. Sir Merrik pointed out that the whole plan was really based on the continued development of research. Additional research facilities were wanted. In this respect London was very well equipped, but it was important that other veterinary centres in England and Scotland should be brought up to the London standard by extension and development.

REPORT

Foot-and-Mouth Disease Research Committee

FIFTH PROGRESS REPORT*

The previous report (Fourth Report) was issued in 1931. In the interval two additional compounds have been added to the Experimental Station at Pirbright to provide extra accommodation for large animals.

There is reference to the danger of losing members of the research staff at unduly frequent intervals because the employment is on a temporary basis, and a hint that this system may be changed.

Research work with small animals has been carried out by Mr. Galloway at the National Institute for Medical Research at Hampstead and from 1931 to 1933 by Dr. K. C. Kenin at the Public Health Laboratories of the University of Manchester.

Dr. J. T. Edwards was transferred from the Lister Institute to Pirbright in 1933 in order that he might have better facilities for immunity investigations.

The cost of the eleven years' work up to March, 1935, has been £153,661.

A readable general account of the ground covered is given in the actual report of the committee in the first 33 pages. Then follow appendices written by the research staff, covering detailed accounts of the work done.

The staff at the Pirbright station describe their work in eleven sections: I. Examination of small wild animals for natural infection; II. Natural infection in the hedgehog; III. Adaptation of virus strains to one species; IV. Study of strains received from Southern Rhodesia and Bechuanaland (partly in collaboration with Mr. Ll. E. W. Bevan); V. Vesicular exanthema in swine; VI. Occurrence of virus in certain body fluids; VII. Duration of immunity in cattle and swine; VIII. Differentiation of virus types; IX. Experiments on animals with artificially mixed types of virus (by Mr. N. Hole); X. Antibody content of blood serum and value of hyperimmune serum, and XI. Viability of virus in tissues when subjected to heating.

Dr. J. T. Edwards gives an account of his work on: nutrition and sex in relation to susceptibility to infection; age and concurrent infection with another disease in relation to susceptibility; the reactions of tame and wild rats to infection, and a discussion on the relation of the above factors to seasonal periodicity in the incidence of foot-and-mouth disease.

Mr. Galloway describes investigations, partly in collaboration with Mr. W. J. Elford, on the virus of foot-and-mouth disease, covering the photodynamic action of dyes, adsorption from infective substrates, viability to heat after desiccation, capacity to exist in ticks, susceptibility of ducks and seagulls and attempts at propagation in eggs. He describes the propagation of the virus of vesicular stomatitis in the chorio-allantoic membrane of the developing hen egg and filtration experiments with this virus and with that of foot-and-mouth disease.

There is a short account by Dr. T. Hare of foot-and-mouth disease lesions in the ear epidermis of inoculated guinea-pigs. Finally, there is a report by Mr. C. Elton, of the Bureau of Animal Population, Oxford University, on faunal surveys of foot-and-mouth disease areas in 1934-35.

Much knowledge has been acquired since the committee was appointed in 1924 and much of it is of practical value to those responsible for the control of the disease. Much of the work done has been of great importance in the study of the nature of the agents responsible for virus diseases in general. In the latter category fall the filtration experiments which permit an estimate of the particles of virus, that of foot-and-mouth disease being among the smallest, 8 to 18 millimicrons (one- to two-hundredths of the diameter of a small bacterium).

Studies of resistance to heat were of interest in relation to the importation of potentially infected food products. It was found that if dried milk were pasteurized in the course of manufacture the danger of infection from this source could be averted. Virus in sweetbreads sometimes withstood boiling for the relatively short intervals equivalent to the heat produced in cooking for food purposes.

The work on immunity is complicated by the multiplicity of types. The subject is discussed in the report in great detail.

Dr. Edwards makes very suggestive remarks concerning the influence of age, sex and nutrition on susceptibility. The bearing of this subject on infection with other viruses and, indeed, on many kinds of infection is of great importance. His further work on this question will be followed with interest. He makes a valuable contribution on the question of the periodicity of outbreaks, a subject on which very little is known in veterinary science.

Much of the experimental work described in the report only seems to stimulate the need for further development. Methods of study not previously available are now easily provided and great progress may be expected even in the

*Fifth Progress Report of the Foot-and-Mouth Disease Research Committee. Issued under the auspices of the Ministry of Agriculture and Fisheries. (1937.) To be purchased directly from H.M. Stationery Office. Price 7s. net. Pp. 385.

REVIEW

[**The Animal Year Book.** VOL. 4. The University of London Animal Welfare Society: University Union, 41, Torrington Square, London, W.C.1. Price 2s. 6d., postage 3d.]

The fourth volume of the Animal Year Book, published by the University of London Animal Welfare Society, has just come to hand. Like its predecessors, it is full of interest and instruction, calculated to arouse in the genuine lover of animals a desire to take an even more active part in the welfare and protection of both domestic and wild animals than has hitherto been undertaken.

As observed in the preface, "the progress of the movement for animal welfare, both at home and abroad, depends very largely on arousing the interest of the rising generation in its problems." Such a publication as the one under review cannot fail to effect much in that direction provided it is adequately distributed.

Of very particular interest, in this volume, is the series of articles entitled "Animals Abroad," perusal of which will satisfy the reader that all is not yet well with the conditions of life which have to be tolerated by the patient and hard-working animals in some foreign countries, at the hands of people who still remain ignorant or callous even in the so-called civilised twentieth century.

Miss Nina Hosali graphically relates the piteous story of the plight of animals in Africa, but is fortunately able to give us some assurance of improvement since the very commendable efforts of the Society for Protection of Animals in North Africa were instituted. She says: "The Arabs themselves are terribly brutal and callous to their animals, but in a country where Nature is herself so cruel, the unavoidable misery so great and the necessities of life so hard to obtain, one can hardly expect otherwise."

We read that in Albania the conditions are just as desperate, and although there is a protection society, voluntary subscriptions are totally inadequate for effecting much in the way of alleviation.

In China no national protection laws exist, consequently the condition of draught animals is frightful. These poor beasts are under-fed, over-worked and beaten, and they are covered with sores. Horses and cattle are destroyed in Tsingtao by a forehead-perforator, hit with a hammer. Sheep and pigs have their throats cut and are disembowelled *before* death.

Buddhists will not take life, even to put an animal out of its misery, but they will allow children or animals to die of exposure or starvation, without a qualm. There are no religious rites involving animal torture, but the general attitude of the Chinese towards animals is one of indifference. Fowls are carried head downwards everywhere; they are usually dipped *alive* in water and then plucked *alive*. It is impossible to obtain the services of a veterinary surgeon and there is no organised veterinary service except in Shanghai. There is a frenzied enthusiasm for animal experiments in the control of which there is no licensing and no law.

Perhaps sufficient has been abstracted from the Year Book to convince our readers that there *are* parts of the world where gross cruelty actually exists, and it may serve to indicate in which direction funds or service should be deviated.

Great Britain is, for animals, a comparative paradise, and it seems obvious to us that people who are imbued with humanitarian feelings for animals, and who would champion their cause, might do well to transform their national into international effort and render aid where it is most urgently and intensely needed.

Among the many interesting articles in the Year Book we would commend to our readers that upon "Cock-Fighting" and "Electrocution of Dogs and Cats" by C. W. Hume, "Operations Without Anaesthetics" by W. M. Levitt, and "Africa's Vanishing Fauna" by A. H. Kirkman.

U.L.A.W.S. has presented such an undeniable case in the defence of foreign animals that we, as veterinary surgeons, can hardly read it without feeling a pang of indignation and pity, and without making a resolve to awake from our apathy and extend a helping hand without a moment's delay.

It is to be sincerely hoped that when the fifth volume of the publication is presented for review we may be enabled to learn of a great extension of British sympathy and practical aid, with a corresponding improvement in the welfare of down-trodden animals.

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relatively near future. The discovery that the hedgehog is such a good experimental animal is of enormous value. Already it has permitted studies of the methods of infection and the behaviour of the virus in the body of the host that could not otherwise have been carried out. The studies on droplet infection in these animals and comparison of the manner in which infection spreads naturally in the larger animals are of the greatest possible interest.

A method of staining smears with neutral-red, enabling one to differentiate between lymph-cells and small monocytes and to indicate qualitative changes in the white blood corpuscles (in infectious anaemia in horses) is described by A. Hjärre and H. Berthelsen in *Nature* (July 24th issue).

N.V.M.A. DIVISIONAL REPORT

Veterinary Medical Association of Ireland*

Joint Meeting with the North of Ireland V.M.A. at Dublin

A SERIES OF DEMONSTRATIONS

The May (Spring Show) General Meeting of the Veterinary Medical Association of Ireland was held in the Veterinary College, Ballsbridge, Dublin, on Wednesday, May 5th, 1937.

The following members were present: Professor T. G. Browne (President), Messrs. E. V. Kelly, J. J. Condon, F. Staples, J. D. Whitty, Professor W. Kearney, Messrs. J. Campbell, James J. O'Brien, Professor A. F. O'Dea, M. J. Ryan, J. M. Murphy (Hon. Secretary), J. S. MacCann, Francis McShane, D. G. Grealy, Thomas Fitzpatrick, G. T. O'Reilly, James Dodd, H. O'Leary, H. R. Langley, H. Dolan, T. A. Mernagh, J. J. Lyons, W. Joyce, Gerald A. Morrin, William E. McDonald, S. Conway, R. R. Pierse, L. M. Magee, E. W. Little, Sean O'Donovan, J. E. Fitzgerald, M. J. MacClancy, J. J. E. Kenny, J. P. Nowlan, P. F. Dolan, J. F. Timoney, Professor J. J. O'Connor, Messrs. P. Harnett, M. J. Byrne, Desmond O'Connor, T. O'Leary, D. McCarthy, D. Reeves, J. M. Morris and A. P. Harris. Robert J. Roe, Cyprus, was present as a visitor.

In response to an invitation to the North of Ireland Veterinary Medical Association the following members of that Association attended: Messrs. Frank Russell, Lisburn; H. C. Kelly, Bangor; W. G. Clarke, Armagh; Adam Hodgins, Nenagh; T. Finch, Portadown; P. L. Shanks, Belfast; H. G. Lamont, Belfast; William S. Lamont, Cookstown; Hugh McGilmore, Co. Down; H. McConnell, Armagh; D. N. O'Neill, Newry; W. J. G. Jones, Newry; G. J. Crawford, Londonderry; Thomas H. Robinson, Belfast; R. Moore, Tyrone; J. McAllan, Belfast; W. Burke McAleer, Dublin; F. W. Hart, Enniskillen; J. W. Morrow, Coleraine; J. I. Magowan, Belfast; Edward J. Hughes, Middletown; T. Y. Ranson, Dungannon, and W. R. Kerr, Belfast.

Apologies for non-attendance were received from Messrs. R. A. S. Coulter, Roscrea; J. J. Dundon, Limerick; P. McGlinchey, Donegal; R. P. Byrne, Dungarvan; J. H. Norris, Department of Agriculture, Dublin, and F. S. Ringwood, Enniscorthy.

The meeting began at 2.15 p.m. and after the regular business had been transacted the following demonstrations were given:—

*Received for publication June 16th, 1937.

Demonstrations

A Method of Injecting Calcium Boro-Gluconate Solution for the Treatment of Milk Fever
(Mr. E. V. Kelly, M.R.C.V.S., Kells)

Apparatus.—A rubber cork fitting into an ordinary quart bottle. The cork is fitted with two brass tubes—one short, to which rubber tubing and a hypodermic needle is attached; the other tube extends to the bottom of the bottle and is fitted with a rubber bulb.

The solution was boiled and put into the bottle, which had previously been flushed out with very hot or boiling tap water. When the bottle was inverted and air pumped in, the solution flowed in rapidly. About one minute sufficed to inject the 25 oz. of solution recommended. Mr. Kelly stated that it was preferable to give half on each side of the neck. It was equally convenient for intravenous injection and if the calcium was given in this way it was usual to give about half the solution intravenously and the rest subcutaneously. A very spectacular result occurred after intravenous injection, and Mr. Kelly explained that he had seen cows, deeply comatose, begin to feed five minutes after this method. He said that he had completely discarded inflation since 1931 and that he must have treated over 500 cases since that time. He had seen the calcium treatment succeed in cases which relapsed quickly after inflation. An occasional case relapsed after calcium also, but a repetition of the dose usually brought about recovery. Further, an occasional case was lost, *e.g.*, the cow which had been down all night and was found in the morning with acute symptoms and delirium. These cases were given 2 to 3 oz. chloral per tube and the latter when passed would often relieve the tympanites of the rumen which was usual in such cases. The cases with severe delirium should get a second dose in 15 to 24 hours, and bromides and chloral given every five or six hours. Sometimes even in severe cases, a second visit was not necessary. The demonstrator stated that he had given up using strychnine even in the "quiet" comatose type of case, as he considered this drug better dispensed with in milk fever, although there might be no real objection to its use, provided the animal had no twitching of muscles or signs of nervous irritability. In the latter type of case the strychnine was strongly contra-indicated. The dose used was 3½ oz. calcium boro-gluconate in about 25 oz. boiled tap water. It was suggested that failures and relapses were due in some cases to too small a dose being used. After using the treatment without any inflation on so large a number of cases, Mr. Kelly expressed the decided opinion that this was superior to the inflation method alone, judged from the point of view of the number of recoveries and the

rapidity of recovery. Its other advantages over the inflation method need not be stressed. He recommended that not more than about one-fourth of the milk should be taken away for the first 24 hours; he generally suggested just as much as would keep the calf going.

The Treatment of Chronic Mastitis in Cows by Injection through the Teat Duct

[Entozon in the Treatment of Mastitis]
(Professor A. F. O'Dea)

The apparatus used was a 3-litre Pyrex glass flask, fitted with a rubber bung, pierced for the passage of two glass tubes.

One of the glass tubes passed only a short distance beyond the lower surface of the bung; the other was long, reached almost to the bottom of the flask and to it was attached a piece of rubber tubing 6 ft. long carrying a teat syphon at its distal end. Injection was made on the syphon system, which had the advantage over the tube and funnel in that the possibility of contamination is obviated. The use of a syringe for injection is not recommended. This apparatus can easily be fitted up in any surgery as the 4 mm. glass tubing can be cut to the required lengths and readily bent, over an ordinary bunsen. The solution can be prepared in distilled water and boiled before leaving the surgery, the required degree of temperature being obtained on arrival at a case by immersing the flask in a bucket of hot or cold water. The technique followed was that recommended by the manufacturers. Professor O'Dea said that he found this treatment effective in those cases of streptococcus mastitis which were not advanced. He did not recommend its use in acute mastitis or in chronic mastitis following acute. In view of the increasing prevalence of chronic streptococcus mastitis in dairy herds he advised his hearers to read Minett, Edwards and Stableforth on the eradication and treatment of this disease.

The Taking of Blood Samples for the Abortion Agglutination Test

(Professor A. F. O'Dea)

The hair was clipped over the jugular vein, a short distance posterior to the junction of the submaxillary and jugular veins, and the skin disinfected. A cord drawn tightly around and near the lower part of the neck distended the vessel. The skin was pinched up and a 2½-in. sterile needle was made to penetrate to a depth of half an inch into the subcutaneous tissue without yet attempting to penetrate the vein. The line of the vein was then accurately located, when a short jab caused the needle to penetrate its outer wall. Compression was maintained by the cord until a sufficiency of blood was drawn into a sterile bottle—half an ounce is usually sufficient. The operator stated that puncture of the vessel can be carried out very easily and rapidly by this method. The secret is to have a sufficient length of needle in the subcutaneous tissue so that its passage into the vein will not be interfered with by the clasping of the skin when the short jab into the vein is being made. This method obviates the necessity for incision of the skin with a lancet or bistoury, and it does not leave a wound which is liable to infection and annoyance by flies. He stressed the necessity for immediate cleansing of the needle by ejecting a jet of sterile water from a syringe through the lumen before the blood had congealed.

Method of Taking Uterine Swab from Mare

(L. M. Magee, M.R.C.V.S., Dunboyne)

Mr. Magee explained that this method was a simple one and was much more efficacious than the crude methods used by some practitioners. He put a side line on the mare, bandaged her tail and sponged out the dock with a little antiseptic. Having previously sterilised his instruments, he inserted a vaginal speculum; to ensure good light he had an electric battery, to which was attached an elastic band worn around the head with the light in the centre of his forehead. The sterile swab was enclosed in a glass tube (test tube pattern) on the end of a narrow glass rod, which was inserted into the cork. He then took a very long, narrow forceps, carefully withdrew the cork and swab from the tube and used great care that the swab did not become contaminated. He inserted the swab into the os and obtained the necessary material and carefully returned the swab into the test tube.

Nerve-Blocking for Dishorning of Cattle

(Professor T. G. Browne)

Professor Browne demonstrated the technique of this operation at the Congress of the N.V.M.A. at Scarborough, 1936, and full details of the technique employed were described in the Congress Number of the *Veterinary Record*, 1936, p. 1175.

During the past year (said Professor Browne) opportunities had presented themselves to him for a more extended trial of this operation, as a result of which this method of anaesthesia could be recommended as being most effective provided the injection of the local anaesthetic was correctly made. The horns could be removed without any evidence whatever of pain, as the demonstration that day had shown.

One practitioner who had used this method had informed the demonstrator that in the case of large animals there was sometimes evidence

of pain during the operation in the lower portion of the anaesthetised horn towards the ear, but Professor Browne himself had not experienced this difficulty. That might, of course, be due to faulty technique in making the injection, but it was possible that in large animals where the base of the horn was very large the lower portion of the horn core might derive some of its nerve supply from the nerves supplying the skin of the ear. Should this difficulty arise in dealing with large horns it could probably be surmounted by making a few subcutaneous injections of small quantities of the anaesthetic between the base of the horn and the ear.

The correct site for making the injection was one inch below the base of the horn slightly (a quarter of an inch) behind the lateral ridge of the frontal bone. The injection must be made subcutaneously and not into the muscle. The best procedure was to insert the needle close behind the border of the lateral ridge of the frontal bone and then direct it ventrally towards the angle of the jaw for not more than half an inch, so that the point of the needle when inserted would be subcutaneous about a quarter of an inch behind the lateral ridge of the frontal bone, *i.e.*, directly on the nerve supplying the horn core.

Any local anaesthetic might be used, but the demonstrator usually used "Parsetic," since it appeared to be cheaper than most others. About 5 c.c. were injected over the nerve of each horn. This anaesthetic appeared to require about 10 to 15 minutes to produce its maximum effect and this would last for about half an hour or longer.

The operation was done with the saw and the operator might stand either in front of the animal or behind the head at the animal's side.

The best method of restraint was to have the animal's head held on a crossbar across a doorway.

A disadvantage of this method of anaesthesia was that the animal must be caught and restrained on two occasions, first for the injection and then within an hour for the operation. In dealing with numbers of animals, however, there was no loss of time, since they could be dealt with in batches of four or five. It was most important to have the animals enclosed in as small a space as possible or preferably tied up in stalls, so as to avoid excitement in catching and recatching. If there were no waste of time in catching the animals, 12 to 15 per hour could be dealt with.

It would be advisable for the beginner to procure the head of an ox, dissect out the nerve supplying the horn and practice making the injection at the correct site, before attempting the operation on the live animal.

The animal used for the demonstration was a two-year-old heifer.

Euthanasia (Spaniel) by Intravenous Injection of Nembutal and Intrathoracic Injection of Hydrocyanic Acid

(Professor J. J. O'Connor)

Subject.—An aged cocker spaniel in normal health.

The dog was weighed and one-fifth gr. per bound body weight of nembutal was injected into the external saphena vein. The drug had an immediate effect, the patient becoming completely anaesthetised within a couple of minutes without any prior stage of excitement. This was followed by the injection of 10 c.c. of hydrocyanic acid intrathoracically, as the result of which the respirations were markedly increased for a few seconds and then ceased. The heart stopped in a few seconds after the respirations. There was no cry or sign of distress, death being perfectly peaceful.

Osteotomy in a Greyhound under Nembutal Anaesthesia

(Professor J. J. O'Connor)

Subject.—A fawn greyhound dog.

History.—There had been a fracture of the right forearm, which was set crooked with a convexity on the inside of the limb above the knee, rendering the animal unfit for racing.

Procedure.—Nembutal in the proportion of one-fifth gr. per pound body weight was injected into the external saphena vein. After the injection the animal whined for a while and about five minutes elapsed before the paw reflexes disappeared and complete anaesthesia ensued. The patient was put on a sterilised cloth, lying on its right side on the table. The affected limb was enveloped in a sterilised calico cloth, and a window was made in this cloth opposite the convexity in the inside of the limb. The skin was shaved and treated with tincture of iodine at the site of operation and its vicinity. A tourniquet having been applied on the upper part of the forearm, a transverse incision was made through the skin over the centre of the convexity equal in length to half the circumference of the limb. A wedge-shaped piece of bone was removed by means of a saw from the thickness of the bone, the base of the wedge corresponding to the surface of the convexity, thus allowing the limb to be straightened by bending the distal portion inwards.

The cutaneous wound was sutured and a dressing of gauze cotton-wool and splints applied. The animal was under no restraint and made no movement during the operation.

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Speaking generally about nembutal anaesthesia, Professor O'Connor said he considered it safer and more convenient than chloroform. Occasionally it was disappointing, especially in

large dogs such as greyhounds, the animal whining and remaining in an excited condition although it had received a full dose of the drug: this was more likely to happen if the injection were not made slowly. Exceptionally an animal failed to recover from its effect; this result occurred chiefly in debilitated animals, especially of the smaller breeds, such as pugs and Pekingese terriers.

Careful attention should be paid to the dosage, One-fifth gr. per pound body weight had been found safe for all sizes of dogs, though some authorities considered that one-seventh gr. per pound body weight was the correct dose for large dogs. In his experience, however, this dose sometimes proved insufficient. It was very important to make this injection slowly, as advised by Professor Wright. When anaesthesia was not produced it was necessary to give a few inhalations of chloroform or ether and oxygen. He found ether and oxygen perfectly satisfactory for small animals. He had been using it for years and without a single mishap, and he considered it safer than nembutal. The latter was a great boon for operations on the head region, where a muzzle would be in the way of the operation. Nembutal also produced anaesthesia when introduced intraperitoneally, but required about 15 minutes to complete its effects, the animal in the meantime staggering and falling repeatedly before it became unconscious. This was the better method to adopt when the vein was very small or difficult to raise or when the operator had not had experience of the intravenous method.

Collecting Blood Samples from Cattle and Poultry, and Specimens of Interest in Laboratory
(Professor W. Kearney)

Professor Kearney described some of the common diseases of poultry and stressed the necessity for a better knowledge of poultry ailments by members of the profession, pointing out the likelihood that certificates of health from veterinary surgeons will be required for poultry before exhibition at some of the Free State shows in the near future. He also demonstrated the method of bleeding a fowl, the application of the avian tuberculin test and the vaccination of poultry against fowl pox and fowl typhoid.

* * * * *

Welcome to North of Ireland Members

After tea had been served the meeting was resumed. The President said that before proceeding with the ordinary business of the meeting he should like, on behalf of the Veterinary Medical Association of Ireland, to extend a most cordial welcome to the members of the North of Ireland Veterinary Medical Association who were with them that evening. So far as he was aware that was the first occasion on which those two Associations had come together and he expressed the hope that, since a beginning had now been made and the ice had been broken, that meeting would lead to more intimate relationship between the Associations. It gave him great pleasure personally to welcome so many of those whom he knew so well, and he was particularly pleased to see with them that evening his past clinical teacher, to whom he owed so much for inspiration when seeing practice during his student days. He referred to Mr. Lamont, senr., from Cookstown.

Some members of the profession might have the impression that the North of Ireland Association came into being as a consequence of the "Border," but that was not the case because the Northern Association was in existence many years before the Border was even thought of, just in the same way as the Munster Association used to exist, so that these different Associations in Ireland had no political significance. He should like, therefore, to express the hope that that meeting might be regarded as something in the nature of an Irish Congress in miniature and the beginning of greater things to come.

Mr. H. D. Gilmour, President of the North of Ireland Veterinary Medical Association, then suitably replied by thanking the members of the Veterinary Medical Association of Ireland for their kind invitation and hospitality.

Resolution.—A resolution was then proposed, seconded and passed unanimously to the effect that, in view of the successful demonstration that evening of dishorning cattle by means of a local anaesthetic, a request be forwarded to the Free State Government to have the Animals Anaesthetic Act of 1919 amended in order to legalise the use of a local anaesthetic for this operation.

Paper.—The President then introduced his paper, "Some Recent Advances in Veterinary Therapeutics and Diagnosis of Special Interest to the Practitioner." In doing so Professor Browne observed that this subject was a vast one, so that he had some difficulty in deciding just what to include and what to exclude in order to cater for different tastes, for he realised that the more recent graduates who had gone through their college course during the past few years would be acquainted with most of the recent advances already. He had therefore arranged his paper so that one part might interest the more senior members of the profession, while the other part might be of more interest to the more recent graduates. [The President's paper is reproduced, together with a report of the ensuing discussion and of the essayist's reply, at the commencement of this issue of the *Veterinary Record.*—*Editor.*]

Close of Meeting.—At the close of the meeting Mr. McAllan, Chief Veterinary Officer, Northern Ireland, proposed a vote of thanks to the President for his interesting paper and his able reply. He also thanked the members of the Veterinary Medical Association of Ireland for their hospitality and for the very interesting and instructive evening, and expressed the hope that these joint meetings between the two Associations would in future be arranged to take place on alternate years in Dublin and Belfast.

The President, in reply, thanked Mr. McAllan for his complimentary remarks and expressed his particular pleasure on having Mr. McAllan and so many of his flock from Northern Ireland with them that evening. He quite realised that the Chief Veterinary Officer of Northern Ireland was an exceedingly busy man and doubtless came there at considerable inconvenience, so that his presence was very much appreciated.

J. M. Murphy, *Hon. Secretary.*

In Parliament

The Agriculture Act

On Friday of last week both Houses adjourned for the summer recess until October 21st. On the former day the measure embodying proposals for the establishment of a State Veterinary Service to combat the diseases of animals —the Agriculture Act—received the Royal Assent, as did the Milk (Amendment) Act and the Cinematograph Films (Animals) Act. Thus closed a session which has included proceedings of supreme importance to the members of the veterinary profession, and which have been the subject of full record and comment in these columns throughout.

* * * * *

The following questions and answers were recorded in the House of Commons prior to the adjournment:—

Tuberculin-Tested Milk

Sir E. Grigg asked the Minister of Agriculture whether he can give the House any information as to the conformation of the tribunal which inquired into the position of producers of tuberculin-tested milk; when this inquiry began; when its report was submitted to him; whether that report will be published; and whether the producers of tuberculin-tested milk asked to be included in the Milk Marketing Scheme or pressed, on the contrary, for permission to remain outside it?

Mr. W. S. Morrison: The Tuberculin Tested Milk Producers' Association lodged certain objections to the amendments of the Milk Marketing Scheme which, with other objections, were considered last autumn at a public inquiry held by Mr. N. L. Macaskie, K.C. At the conclusion of this inquiry Mr. Macaskie, on my invitation, held a further public inquiry into the question whether it was desirable that I should consent to the withdrawal of the exemption of sales of tuberculin-tested milk from the operation of Part VI of the Scheme. This latter inquiry commenced on December 10th, 1936, and Mr. Macaskie submitted his report on March 22nd, 1937. Following the usual practice the report will not be published.

As to the last part of the question, the Association asked that the exemption of sales of tuberculin-tested milk should be made a permanent provision of the scheme, and if, contrary to this submission, the exemption was not continued, that special provision should be made to safeguard the position of producers of tuberculin-tested milk.

* * * * *

Milk (Pasteurization)

Mr. Leach asked the Minister of Health in view of the many loopholes in the evidence adduced in support of allegations against raw milk in connection with outbreaks of scarlet fever and typhoid fever, before he sanctions any general claim for the compulsory pasteurization of milk, whether he will have a searching inquiry made into the allegations made against raw milk?

Sir K. Wood: I am not aware to which particular outbreaks of these diseases the hon. Member refers. I am satisfied that in all recent cases of this kind which have been investigated by my Department and in which the outbreak was traced to the consumption of raw milk, the evidence on this point was conclusive. The Cattle Diseases Committee of the Economic Advisory Council which reported in 1934, reviewed the question of the danger of the spread of these diseases through the medium of milk, before they recommended compulsory pasteurization in large towns, and I do not consider it necessary to institute any further inquiry to this question.

Mr. Leach: Did the Minister not agree that it is better to have your milk clean and unpasteurized, with live bacilli, if there should be any, rather than pasteurized when the bacilli have been made corpses?

Sir K. Wood: I will carefully ponder over that question.

* * * * *

Livestock (Licensing of Bulls) Act

Colonel Ponsonby asked the Minister of Agriculture whether, as a result of experience of the working of the Improvement of Livestock (Licensing of Bulls) Act, 1931, he is satisfied that the objects of the Act are being achieved?

Mr. W. S. Morrison: The Act has now been in force in England and Wales for three years, and while I am satisfied that what is usually known as the "scrub" bull has, to a very great extent, been eliminated, it is obviously desirable, in the interests of the livestock industry, that a sufficiently high standard in regard to the licensing of bulls should be maintained, whether in regard to beef or dairy cattle, and I have no doubt that in this matter I can count on the co-operation of the appeal referees nominated under the Act by the breed societies and the National Farmers' Union.

* * * * *

Sheep Scab

Mr. W. Roberts asked the Minister of Agriculture whether, in view of the continued freedom of the county of Cumberland from outbreaks of sheep scab originating in Cumberland, he will relax the restrictions affecting the movement of sheep from the county before the autumn movement and sales of sheep begin?

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Mr. W. S. Morrison: In view of the great improvement in the position of the country generally with regard to sheep scab, I recently proposed to local authorities which have made regulations requiring sheep moved into their areas to be double dipped either before or after movement that such regulations should be revoked. The replies received indicate that a large majority of the local authorities concerned concur in my view, and I therefore propose to make an Order early in August directing the revocation of these regulations.

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Poultry Industry (Research, Weybridge)

Sir G. Fox asked the Attorney-General whether he will submit to the High Courts the question whether commercial and competitive activities now carried on by the Ministry of Agriculture in connection with the operations of the poultry disease research station at Weybridge are permissible under Sub-section (3) of Section 2 of the Board of Agriculture Act, 1889, in view of the wording of such section, which only empowers the Board to make or aid in making such inquiries, experiments, and research, and collect or aid in collecting such information as they may think important for the purpose of promoting agriculture or forestry?

The Attorney-General: I have made some inquiries into this matter and I do not think any legal question arises with regard to what is being done. In any event my hon. Friend's question is based on a misunderstanding of my relations with Departments of State so far as proceedings in the courts are concerned.

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Poultry Industry

Sir G. Fox asked the Minister of Agriculture whether, in view of the fact that on the inauguration of the official poultry institute scheme a Department for research into the diseases of poultry was established at Weybridge with a full-time poultry disease research officer, he can state when blood tests at rates undercutting private enterprise were first carried out; and what are the precise sections of the Acts of Parliament which permit any trading in charging for blood tests?

Mr. W. S. Morrison: I would refer the hon. Member to the reply which I gave to similar questions on July 8th. The work in connection with the blood testing of poultry at the Weybridge laboratory is a normal development of the work of research and collection of information authorised by Section 2 (Sub-section 3) of the Board of Agriculture Act, 1889, which empowers the Ministry to make such enquiries, experiments and research and to collect such information as they may think important for the purpose of promoting agriculture. The work at Weybridge on this subject is self-supporting and there is no question of undercutting private enterprise. Having regard to the fact that the serious incidence of disease is one of the major difficulties of the poultry industry, it is the duty of my Department to do all that is possible to assist in the eradication of disease, and to provide blood-testing facilities at the lowest price at which the service is self-supporting.

Sir G. Fox asked the Minister of Agriculture whether he will state the name or names of the poultry keeper's associations or societies, or laboratories, working in conjunction with such societies, which asked him to reduce the blood-testing charge from 2d. to 1½d.; and whether this reduction was intended to have an undercutting effect on the private and non-subsidised organisations offering a similar and more popular service?

Mr. W. S. Morrison: Representations were received from the Accredited Poultry Breeders' Federation, Warwickshire County Council, Harper Adams College and Bristol University urging that steps should be taken to reduce the fee of 2d. for blood-testing, so that Accredited Poultry Station Breeders might be able to have their samples tested at the lower rates generally charged to owners outside the scheme. No question as to under-cutting private organisations arises, but it is important that the Ministry should continue this work in order to gain an indication of the incidence of disease and the problems of the industry.

. . . . . .

Biological Products (Sale)

Sir G. Fox asked the Minister of Agriculture why his Department manufactures and sells biological products which are being efficiently made and marketed by private non-subsidised commercial firms; and whether, seeing that it would be better for the Ministry's staff to be engaged on research into diseases rather than entering into commercial competition, he will put a stop to this practice?

Mr. W. S. Morrison: In the course of research the Ministry's laboratory at Weybridge elaborated certain biological products which, after extensive trials in the field, were duly marketed. Similar preparations were subsequently marketed by various commercial firms but the demand for the Ministry's products has continued and in these circumstances it is not proposed to discontinue the supply.

. . . . . .

Mechanised Cavalry (Soldiers' Equipment)

Mr. Croom-Johnson asked the Secretary of State for War whether any and, if so, which of the following articles are now being issued as part equipment to the 11th Hussars and any other and which mechanised units, namely: spurs, clasp-knife for removing stones from horses' hooves, cavalry bandoliers, swords, sword-knots, sword-belts, riding-breeches, cavalry-puttees, puttee-tapes, and lanyards; if so, with what object such issues are being made; and when it is intended to cease such issues?

Mr. Hore-Belisha: The whole question of uniform and personal eqdipment for soldiers of mechanised units is at present under review, and in the meantime all the articles of equipment mentioned are issued to mechanised cavalry regiments and cavalry armoured car regiments, including the 11th Hussars. The object of continuing such issues is to maintain uniformity of equipment until the new scales are introduced. The new scales will be published as soon as possible after certain trials have been completed.

There has been an increase in the number of outbreaks of anthrax in this country, 431 cases having occurred over a period this year compared with 271 in the same period of last year. The Council of the Royal Agricultural Society has decided to ask the Ministry of Agriculture to inquire into the increased incidence of the disease.

Royal College of Veterinary Surgeons

Membership Examinations, July, 1937

LIST OF SUCCESSFUL CANDIDATES
(*Concluded*)

Dublin

FIVE YEARS' COURSE

FIRST YEAR:

Bowen, L. T.	Kinsella, L. K.
*Carlisle, J.	Lynch, T. A.
Collins, W. C.	Lynch, T. J. (B)
*Davison, W. F.	*McGowan, D.
*Dempsey, N. P.	McVeigh, D.
Dodd, A. M. (B)	Mahony, I. J.
Donnelly, A. D. (B)	*Meegan, P. A.
Gallagher, M. A.	Quinn, B. J. (C)
Htwe, S.	Thompson, T. W.
*Hutch, Lian.	*Whitty, B. T.
Kane, G. J.	Yasin, S. A. (B)
Kavanagh, S.	

*Denotes Second-Class Honours.
(B) Denotes credit in Biology.
(C) Denotes credit in Chemistry.

SECOND YEAR:

Bassett, B. D.	O'Hagan, A.
Bennett, W. N.	O'Hagan, P.
*Burkhardt, J. A.	O'Leary, C.
Hutch, S.	Power, W. P.
McCormack, H. J.	*Sheehan, Miss R.
McKinley, W. G.	Sloan, W. G. (P)
Nayar, R. K. (P)	Treanor, G. A.

*Denotes Second-Class Honours.
(P) Denotes credit in Physiology.

Animal Management

Bassett, B. D.	O'Leary, C.
Burkhardt, J. A. (credit).	Pritchard, R. W. Ray, N.
Hutch, S. (credit).	Sheehan, Miss R. (credit).
Keast, P. H.	Sloan, W. J. (credit).
McCormack, H. J.	Treanor, G. A. (credit).
O'Hagan, A.	

THIRD YEAR:

Alley, J. C.	Harnett, W.
*Collery, L.	*Jones, James.
Cosgrave, J. S.	McCrea, J. C.
Fresby, M.	McDowell, H. G.
Gleeson, L. N. (A)	Nagle, J. J.
*Hart, B. H.	O'Reilly, J. J.

*Denotes Second-Class Honours.
(A) Denotes credit in Anatomy.

FOURTH YEAR:

Cooper, P. J.	Green, S.
Cotter, J. D. (P)	Martin, W. B.
Fallon, J. A.	

(P) Denotes credit in Parasitology.

FIFTH YEAR:

Barry, J. T.	McAteer, J.
Hart, F. S.	O'Reilly, M. J.
Hayes, P.	

FOUR YEARS' COURSE

Class C

Drewett, E. P.	Scott, T.
Heney, J. W.	Whitling, V. S.
Oliphant, Miss J.	

Class D

Dodd, D. O.	Mackay, K. J.
Livingstone, J.	Matheson, J. A.

Notes and News

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Aug. 9th.—Meeting of the Editorial Committee, N.V.M.A., at 36, Gordon Square, W.C., 4 p.m.

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N.V.M.A. CONGRESS AT BOURNEMOUTH

Latter Half of the Proceedings

We are now in a position to complete this preliminary account of the proceedings of Congress, which we entered upon on pages 960 and 961 of our issue of last week.

The Annual Banquet, which was held at the Royal Bath Hotel on the Wednesday evening, proved an unqualified success, many of those who had neglected to apply for tickets prior to the commencement of the Congress being unable to obtain admittance owing to the limits imposed by the size of the banqueting hall.

This year's banquet was one of distinction for we were honoured, for the first time in the history of the Association, by the presence of His Majesty's Minister of Agriculture and Fisheries in the person of Mr. Morrison, whilst we were also supported by a worthy company of other distinguished guests including the Earl of Malmesbury, Viscount Lymington, Mr. W. Craven-Ellis, M.P., Sir John Kelland, Sir Fergus Graham and Miss Olga Nethersole.

In proposing the toast of the National Veterinary Medical Association, Mr. Morrison took the opportunity to assure his listeners that by the passage of the Agriculture Bill the veterinary profession would be raised in status and that it would gain much but lose little or nothing. There was no ground for individual apprehension for the Government was determined to effect the transfer of those local government veterinary officers who were absorbed into the central service with the minimum of inconvenience to the officers themselves, while as liberal terms as possible with regard to the retirement age, superannuation and other rights of the individuals concerned, would be offered. Movements would be reduced to the minimum, for it was recognised that much good would result from leaving an officer in that area where, by personal contact and knowledge of local conditions, he was best able to serve the needs of agriculture.

In replying to the Minister, the President seized the opportunity to stress the aims and needs of the veterinary profession in connection with the Government's scheme for a centralised veterinary service and pleaded, with forceful logic, for recognition of these objectives by their incorporation in the final plans in order that an efficient and smooth-working veterinary department might be allowed to develop within

the Ministry of Agriculture and Fisheries. Fuller reference to the Minister's speech appears in the editorial columns of this issue.

After the other toasts, which were ably proposed and which evoked able and interesting replies, tinctured with just that modicum of humour which ensures an enthusiastic reception, the evening was terminated with a short dance and cabaret show.

Following a day so full of strenuous business, Thursday was set aside for purely social purposes. A large gathering assembled at the station early in the day and were conveyed in reserved carriages to the Southampton Docks. Upon arrival at the docks, the company divided into small parties which were conducted on a tour of inspection of the S.S. *Berengaria*, a fine vessel which, although now past her prime and with but two more years' service before she reaches "superannuation age," still remains an outstanding example of the "greyhounds of the Atlantic." The company then partook of a welcome lunch in one of the Southern Railway buffets, following which a journey on foot was made along the huge expanse of newly-built docks to the King George V Graving Dock, built especially to accommodate the *Queen Mary* which, incidentally, only very recently had occupied it for an overhauling. Here the assistant manager outlined the wonders of this huge "basin," the great engineering feat which it represented and the *modus operandi* employed when it receives and releases a ship of the dimensions of the *Queen Mary*. Inspection of one of the dismantled propellers of this, the latest, British contribution to sea travel, and the large power station which operates the graving dock concluded the visit and a weary, "foot-sore" party commenced the "route march" back to the buffet for tea.

In spite of the strenuous day's recreation, a large number met in the evening at the Bournemouth Pavilion where a dance was held in aid of the Ladies' Benevolent Guild. This dance proved to be a great and welcome event for, under the able direction of Mr. Sim Grossman, the band leader—who, entering into the spirit of benevolence, adopted the duties of M.C. with commendable enthusiasm—what was probably the most enjoyable dance of the whole Congress brought the social side of the proceedings all too swiftly to a close.

The final day of our stay in this deservedly popular seaside resort opened with the paper by Mr. R. H. Smythe on "The Clinical Aspect of 'Hoose' (Parasitic) and Allied Conditions in Cattle," and despite the rather poor attendance a good, although perhaps somewhat nebulous, discussion ensued.

The Closing Meeting then took place and the President (Captain Simpson) proceeded to invest his successor, Mr. Donald Campbell, with the chain and robes of office. The new President briefly expressed his thanks to Captain Simpson and the members and then proposed a hearty vote of thanks to his predecessor, which was carried with immense enthusiasm.

There followed the similar and well-merited tributes accorded to those whose untiring efforts had made the Congress such a real and undoubted success and finally, before declaring the proceedings at an end, the President called upon Dr. Jordan, the Hon. Local Secretary, to accept at his hands a sporting gun in a leather case, as a slight token of the thanks which members wished to accord him in recognition of his untiring energy in connection with the many and varied duties his office had entailed.

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R.C.V.S. LIBRARY

The Central Library for Animal Diseases will be closed from August 16th to August 28th.

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PERSONAL

Will.—Sherren, Mr. Edward Richards, M.R.C.V.S., of Edgware, Middlesex (net personalty £4,367), £13,162.

* * * * *

R.C.V.S. OBITUARY

Hobbs, Frederick Charles, The Lodge, 2, St. Julian's Avenue, Newport, Mon. Graduated London, December 14th, 1897. Died July 21st, 1937; aged 62 years.

* * * * *

GOVERNMENT'S MILK POLICY

Increased Treasury Assistance for Producers

Creating Confidence in Cleanliness of the Supply

The Government's milk policy is outlined in a White Paper (Cmd. 5533. Stationery Office, price 2d.), which has been issued since the publication of our last number.

The proposals are commended by the Government as a policy which will provide for the dairying industry a basis for an increasing sale in the liquid market; will secure cheap milk for those classes of consumers to whom it will be of particular value, and will provide for consumers generally a permanent improvement in the cleanliness and purity of the milk supply.

The Government, the White Paper states, believe that the only sure foundation for the prosperity of the industry is an increased consumption of liquid milk. An essential step is to establish public confidence in the cleanliness of the supply, and it is with this object that they propose to invite Parliament to provide additional Exchequer assistance.

Under the Milk Act, 1934, the receipts of the milk marketing boards from manufacturing milk were supplemented by a system of repayable Exchequer advances based on standard prices a gallon of milk used for manufacture. The Government now propose to safeguard the industry against the effect of any serious fall in the prices of butter and cheese by means of a price-insurance plan under which Exchequer

assistance will be payable to the boards in respect of standard gallonages of milk used for butter and cheese in the event of the average prices of imported butter and cheese falling, over a period, below 100s. and 56s. per cwt. respectively. The present average prices of imported butter and cheese are of the order of 115s. and 72s. per cwt. respectively.

Accredited Milk

To give momentum to the production of quality milks the Government propose that Exchequer contributions should be made towards the additional costs incurred in the production of milk of the accredited standard, milk of the tuberculin tested standard and milk from attested herds.

The premium on accredited milk now payable from the pool funds of the Board is 1d. a gallon. It is proposed that, for the five-year period beginning October 1st, 1938, this should be increased to 1¼d. a gallon, of which the Exchequer contribution would be ¾d. for each of the first two years, ½d. for each of the third and fourth years, and ¼d. for the fifth year, the balance to be borne by the pool.

In regard to tuberculin-tested milk, the premium for the first two years will be 1d. a gallon, towards which the Exchequer contribute ½d. For the third, fourth and fifth years the Exchequer will contribute ¼d. a gallon, and it is proposed that the premium be less than ¾d. a gallon.

Attested Herds

Under the Agriculture Bill of this session financial assistance is provided to encourage the eradication of bovine tuberculosis. This includes an Exchequer payment of 1d. a gallon on milk from attested herds, the Milk Boards being under a contingent obligation to assume this liability in due course. It is now proposed that for two years the premium should be 2d. a gallon, of which the Exchequer would contribute 1½d. For the third year it is proposed that the premium that the Boards shall be required to pay shall not be less than 1¾d. a gallon towards which the Exchequer will contribute 1¼d. a gallon. In view of these new liabilities it is proposed to release the Boards from the contingent obligation mentioned above.

The Government propose that a permanent Milk Commission should be set up to keep under review the production, marketing, and consumption of milk (including the effect of prices on demand), and to make an annual report to Parliament.

The continuance of the scheme for the provision of cheap milk for school children is regarded as essential, and proposals will be brought forward to secure, in co-operation with the industry, a reduction in the price of liquid milk to local authorities for the purpose of maternity and child welfare.

The following shows the estimated cost of the Exchequer contributions to the quality premiums:—

1938-9	...	...	...	£1,700,000
1939-40	...	...	...	1,962,000
1940-41	...	...	...	1,781,000
1941-42	...	...	...	1,425,000*
1942-43	...	...	...	800,000*

*Does not include assistance for attested herds for the fourth and fifth years.

* * * * *

As we announced last week that it was their intention to do, the Milk Marketing Board state that they have now rescinded their resolution exempting sales of tuberculin-tested milk from the operation of Part VI of their scheme. In effect, therefore, all sales of tuberculin-tested milk come within the scope of the milk marketing scheme, but the Board have made provision for the exemption of such sales provided the milk is sold under the designation tuberculin tested.

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ARMY VETERINARY SERVICE

London Gazette—War Office—Regular Army

Royal Army Veterinary Corps

July 27th.—The following Lts. to be Capts. (July 27th): D. F. G. Smith, R. S. T. Bowden, A. D. Seton.

July 30th.—Capt. A. P. MacDonald is secd. on appt. to the Ind. Continuous Serv. Cadre.

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ANIMAL DISEASE RESEARCH: GROWING SCARCITY OF WORKERS

Under the above headings *The Times,* in a recent issue, published the following contribution from a correspondent:—

In urging more intensive research into animal diseases there is a danger of going to extremes. From some of the statements made recently it would almost seem that little has been accomplished and that State expenditure on research to-day is very small.

Actually a great deal has been done. Government grants for animal disease research in Great Britain now exceed £60,000 per annum. In addition, the Agricultural Research Council will shortly enter on a long-range programme of research into contagious abortion at their new farm research centre in Berkshire. Almost every important disease of farm livestock is being attacked by one or other institute, and a large measure of co-ordination has been secured through the committees of the Council.

Moreover, during the past few years new methods of attack on mysterious and obscure diseases have been introduced. In the case of the high wastage in young pigs, for example, a research worker employed by the Council is travelling the country, checking the work of scattered investigators who have dealt with one or other aspect of pig mortality and inquiring into the experience of pig-keepers. Similarly in the case of obscure lamb diseases of the "dysentery" type, due to bacteria, another of the Council's workers is collaborating with the veterinary investigation officers in sheep districts.

Co-operative Work

Co-operative work is, in fact, much more in evidence to-day than ever before. There is close contact between the various veterinary investigation officers at provincial agricultural departments (until recently known as the veterinary advisory officers) and the research institutes. Annual meetings are held at which the two groups, research and advisory, exchange views and arrange for collaborative effort. The veterinary investigation officer is becoming more and more valuable as an intelligence officer to the research institute.

Perhaps in poultry disease most leeway is to be made up, but even here it is wrong to assume that there has been inactivity. There is no research centre specifically devoted to

such work; on the other hand, a good deal has been found out during the past few years, and most poultry troubles now can either be controlled—as with bacillary white diarrhoea—or be avoided by the adoption of ordinary hygienic methods by the poultry keeper.

The important exception is fowl paralysis, but it would be unfair to lay blame for the fact that so little advice can be given on means of combating this scourge. The United States, with its vast scientific resources, is completely baffled, yet the ravages of the disease in that country are even worse than in this. Here a good deal of research has already been done, and it is being intensified, but the results so far have only shown the complexity of the problem. Evidence points to transmission by inheritance, with the potentiality for disease remaining latent until some other factors are met with. If this is so, the task of eradicating the disease will be a difficult one.

Supply of Research Workers

A serious difficulty which confronts animal disease research in the immediate future is the question of personnel. The extension of county veterinary staffs during the past few years has already led—not unnaturally—to some secessions from the research ranks; and moreover has made it increasingly difficult to attract veterinary graduates into the service. On the top of this comes news of the impending establishment of a State veterinary service, which will ultimately double the demand for veterinary men for public employment. The effect on research is bound to be felt for some time.

The Agricultural Research Council were quick to realise the difficulty of competition from the profession. In their first report, issued in 1934, they drew attention to it, and in their second report, issued last year, they pointed out that important work was being held up because suitable men could not be found to do it. Since then has come the announcement of a State veterinary service.

Thus there is the dual problem—the growing competition from administrative and professional work; and the training of the research man himself. The former must presumably be allowed to take its course, with the compensation that much can be done through a State service to use the knowledge already available in controlling major diseases. As to the latter, attempts are already being made to secure science graduates willing to take, by means of a scholarship, the four years' course required to gain the professional qualification. Clearly, however, the career open to such men must be made sufficiently attractive to induce them to undergo so long a period of training.

Scope of Training

It has been questioned whether the existing training of the veterinary student is such as to inspire enthusiasm for research. It is, after all, a training specifically for a profession, and it is bound to be a somewhat crowded course even with the extra (fifth) year recently added. Whether in such circumstances it is possible to do much in the way in interesting students in research may be doubted, and this is one of the points to which the Government Committee now inquiring into veterinary education will presumably give attention.

In one respect the outlook for animal disease investigation is brighter. Medical research workers are co-operating more extensively in attacking problems common to both fields, and the Agricultural and Medical Research Councils are in close contact. Representatives of medical science sit on several committees of the former Council, and there are joint committees supervising special problems. Joint effort of this sort is ideal.

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H.M. STATIONERY OFFICE PUBLICATIONS

The undermentioned have been published recently. Copies can be purchased through any bookseller, or directly from H.M. Stationery Office, at the following addresses: London: Adastral House, Kingsway, W.C.2, and 28, Abingdon Street, S.W.1; Cardiff: 1, St. Andrew's Crescent; Manchester: York Street; Edinburgh: 120, George Street.

	Price net	*Post free*
House of Commons Bills:		
195. Livestock Industry. Lords' Amendments	0 2	0 2½
197. Agriculture. As Amended in Committee	0 6	0 7
181. Agriculture Bill. As Amended on Report. ...	0 6	0 7
Agriculture and Fisheries, Ministry of: Agricultural Research Institutes, Reports on the Work of, and on certain other Agricultural Investigations in the United Kingdom, 1934-1935. (Issued jointly by the Ministry of Agriculture and Fisheries; the Department of Agriculture for Scotland; the Ministry of Agriculture for Northern Ireland and the Agricultural Research Council.) (24-130-0-35).	5 0	5 5
Colonial Office: Colonial Veterinary Service List. First Edition, 1937. (Colonial No. 132.) (58-132.)	0 6	0 7
Public General Acts: Ch. 42. Exportation of Horses	0 1	0 1½
Command Papers: [5533.] Milk Policy.	0 2	0 2½

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BIOLOGICAL ACTION OF X-RAYS

A report on "Some quantitative aspects of the biological action of X- and Gamma Rays," by Dr. C. M. Scott, of the Department of Materia Medica, Edinburgh University, has been issued by the Medical Research Council (Stationery Office, 1s. 6d.).

In a preface dealing with the progress made during the last decade in the treatment of cancer and malignant disease by radium and high voltage X-rays, the Council points out that the remarkable successes of radiation therapy have led to such pressure on both apparatus and personnel that there has been little leisure to undertake research. The subject presents special difficulties, one of which is that measurement of the dosage of radiations is much more difficult than measurement of the dosage of drugs.

"Nevertheless," continues the preface, "the quantitative aspect of the action of radiations is

all-important from a practical point of view, because their therapeutic use depends very largely upon the difference between the dosage needed to injure or kill malignant tissue and that needed to produce the same effect on normal tissues."

Experiments with an isolated frog's heart and the eggs of the bluebottle were carried out by Dr. Scott which revealed the extraordinary variation which living cells display as regards susceptibility to radiation. It is shown, for example, that the irradiation needed to kill the adult fruit-fly is several thousands of times that needed to kill the eggs of the fly.

The evidence of Dr. Scott, the preface states, tends to favour the view that the fundamental action of radiations is on the nucleus of the cell, and thereby on the cell processes that control growth. Hence the susceptibility of cells to radiation depends very largely upon whether their survival is dependent on the power to carry out cell division. Further investigation is urged by Dr. Scott on the lines of careful measurement of irradiation, the recovery of cells from the effects of radiation, and the physiology of the process of cell division.

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Errata.—The following corrections, the necessity for which we regret, should be made in the report of the April meeting of the Dumfries and Galloway Division, N.V.M.A., as published in our issue of last week (*V.R.*, July 31st, pp. 956 and 957).

The paragraph "After lunch several members gave short addresses, that by Miss E. Burnett being as follows:" should be "that by Mr. A. Young being as follows:"

The paragraph at the end of the report should read: "The remaining contributors were Miss E. Burnett, Calderbridge, Mr. J. C. Bennison, Carlisle, and Mr. R. Craig Robinson, Carlisle."

Correspondence

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

All correspondence must bear the name and address of the contributor for publication.

The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

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MISS ALEEN CUST MEMORIAL FUND

To the Editor of the Veterinary Record

Sir,—Once more may we ask you to be so kind as to publish the following list of subscribers to the "Miss Aleen Cust Memorial Fund."

This Fund will remain open until August 30th, 1937, by which time we hope that we shall have received the subscriptions of many more members wishing to assist the Fund.

Yours faithfully,

O. B. Woodward,
P. L. Williams,
(*Joint Treasurers*).

Foregate House,
35, Foregate Street,
Stafford.
July 3rd, 1937.

. . . . .

Professor J. J. O'Connor.
Professor T. G. Browne.
Professor A. F. O'Dea.
Professor W. Kearney.
Professor J. A. Nicholson.
Professor F. C. Minett.
Miss A. Greener.
Miss H. Bisset.
Miss E. H. Patchett.
Miss M. F. Somervail.
W. Anderson, Esq.

Diseases of Animals Acts

SUMMARY OF RETURNS

Period.	Anthrax.		Foot-and-Mouth Disease.		Parasitic§ Mange.		Sheep Scab.	Swine Fever.	
	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Animals slaughtered as diseased or exposed to infection.	Outbreaks reported by the Local Authorities.	Animals attacked.	Outbreaks confirmed.	Outbreaks confirmed.	Swine slaughtered.
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Period 1st to 15th July, 1937	20	42	3	2,575	1	1	2	42	15
Corresponding period in									
1936	13	14	—	—	4	6	1	77	93
1935	10	11	—	—	7	8	7	113	106
1934	9	9	—	—	5	11	8	66	47
Total 1st January to 15th July, 1937	431	514	9	3,187	86	123	129	662	401
Corresponding period in									
1936	271	319	4	379	74	213	145	1,148	816
1935	219	251	34	10,208	77	162	198	1,086	616
1934	224	239	2	93	91	152	346	890	547

Note.—The figures for the current year are approximate only. § Excluding outbreaks in Army Horses.